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AGILE WEB PILOT PROGRAM



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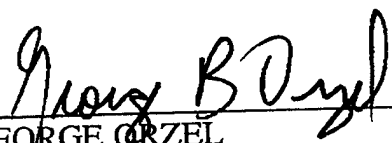
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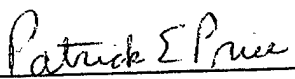
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ABSTRACT

The Agile Web Pilot Program was managed by the NET Ben Franklin Technology Center and was partially funded by an agreement with the federal government's Defense Advanced Research Project Agency's Technology Reinvestment Project. It was designed to respond to the trend in industrial procurement towards consolidating suppliers and demanding greater adaptability and agility in meeting the need for highly customized solutions in an increasingly competitive global marketplace. The pilot program allowed 18 small and medium sized enterprises to experiment with new agile business practices in competitive manufacturing environments by forming virtual organizations within the context of live orders. The goal was to demonstrate how the changes in business practices can be applied and integrated to provide extra value to the customer.

The project showed that developing trust and solid relationships among the participants, led to an enhanced competitive position for the suppliers and optimal, value-added solutions for the customers. In addition, the experiment showed that the key to developing an effective web of suppliers is to foster solid relationships, identify core competencies and to work with customers as partners to provide optimal solutions.

The experiment resulted in a for-profit organization that will continue providing integrated, optimal solutions through a supply chain that has unprecedented flexibility in all facets of manufacturing and design engineering.

Executive Summary

This report provides an overview of the Agile Web Pilot Program. The program formally began in January 1994 as an experiment in business collaboration among a group of manufacturing and design-related firms in eastern Pennsylvania. Funded jointly by The Federal Technology Reinvestment Project and the Commonwealth of Pennsylvania, the actual implementation of the program was initiated and led by the Northeast Tier Ben Franklin Technology Center (BFTC) in Bethlehem, Pennsylvania.

The Application of Agility

Responding to recent trends in industry, as encapsulated by the seminal work on agility, *21st Century Manufacturing Enterprise Strategy*, the BFTC staff outlined a plan to implement agile collaboration among a group of 15 to 20 firms located in Pennsylvania. Part Two, "Application of Agility" outlines the relevance of agility as seen by BFTC and lays out the projects' early goals. Part Two discusses recent supply-chain trends, and explains some of the new demands being placed on suppliers as a result of developments like increased outsourcing, mass customization, shortened product life-cycles, and various pressures arising from global competition. This section then goes on to explain how the BFTC proposed to explore issues in small-business collaboration to respond to recent industrial trends.

Based on their experiences in working with small and developing businesses in Eastern Pennsylvania, the BFTC saw the possibility of enhancing the competitiveness of small firms by enabling them to collaborate with other firms in the region. The BFTC chose to take a "whole-systems" approach to improving the supply-chain. BFTC staffers believed that exploring dramatically different ways of doing business could lead to the next level of collaboration throughout the entire supply-chain as opposed to incremental improvements in current business practices. Building on the recently articulated concepts of agile manufacturing, the BFTC set out to explore ways in which "virtual organizations" could provide optimal solutions for

customers and, thus, insure the competitiveness of the group of design- and manufacturing-related firms selected to participate in the project.

In setting up the project it quickly became apparent that getting the whole chain of customers and suppliers working together for a common goal presented the most important challenge. Learning more about each other, installing technology for rapid flexible communications, and beginning to align systems, led to additional business conducted in more or less traditional ways between the members. However, these efforts were not sufficient to motivate the kind of collaboration that enables high performance systems. For the suppliers, overcoming perceived risks of sharing insider knowledge and trusting their peers proved critical. With respect to the customer, the central task became one of helping the customer to embrace new ways of doing business, so that it could reap the benefits of the new and added value that Agile Web could provide. People-relationships and related issues, particularly getting people to think for the whole versus their own individual role, emerged as the biggest barrier to overcome. Consequently, these became the focus of the Agile Web Pilot Project.

While the project began as a loose consortium of suppliers and customers seeking to learn about and evaluate agility through actual business opportunities, it evolved into a formal corporate entity designed to compete in the marketplace. In addition to providing a single point of contact to facilitate long term customer relations, the resultant corporate form also introduced additional resources to the team to address strategic issues, which most tactically-oriented small businesses lack. Furthermore, the drive to create a business model that can flexibly and rapidly add resources fully integrated with the customer's needs and practices, served as the common goal around which all actions were taken. Customer feedback received during the course of the project has reinforced the advantages and viability of the overall Agile Web concept.

The Evolution of the Agile Web

The next section, "The Evolution of the Agile Web," provides a chronological retrospective of the entire project, and seeks to convey the thought processes and developments that drove the BFTC's changes in approach and the evolving organizational forms of the Agile Web. It describes the evolution from a loose consortium of companies working with the BFTC to

experiment with agile concepts, to a corporation with the goal of winning business in the marketplace through helping the customer to solve problems and optimize their products.

The project began with a number of knowledge and relationship building activities. In order to achieve effective collaboration among Small and Medium Enterprises, the BFTC team immediately recognized the importance of understanding the capabilities of the constituent members. CEO seminars were held to help the company leaders understand agility. Surveys were conducted to assess the participating companies' corporate strategies, products and services, capabilities, equipment, and quality. "Core-competency reviews" were undertaken to target ways in which the companies could come together in order to "cooperate to compete." The idea of selling core competencies was new to the Web participants, and thus the BFTC helped show them how they could see their individual organizations in new ways, focus on their core strengths, and, hence, add value for customers in new ways. Work on recognizing core-competencies also helped to reduce participants' fears of teaming and sharing of information, by helping them recognize that even companies in nominally similar industries have their own unique specialties and markets.

Other start-up activities included a series of meetings to help get the members to know one another and their individual styles. The group seemed receptive to the idea of putting aside individual objectives in favor of what was best for the entire group. But to realize the ultimate state of agile collaboration, we needed more work on developing a common vision of an integrated virtual enterprise and the types of commitment it would entail. Accordingly, we at the BFTC continually worked to develop trust across the membership from the beginning. We found that face-to-face contact in the context of real-world business settings works best to develop relationships.

Trust remained the most important issue. Members seemed hesitant to risk their reputation on Agile Web until it could be "debugged" and proven successful. Despite members' hesitation, trust did continue to grow. Some members, for instance, began working together in more traditional ways on "non-Web" projects. They also began sharing more sensitive information, as they observed the need to do so to provide the best response to particular customers.

Through the early Fall of 1994, none of our bids prepared for customers had yet moved into production, so we developed a simulation exercise to give the members some experience in issues related to working on a joint project. In response to the simulated customer, Web participants formed virtual organization, or “resource team,” to produce and deliver the final product. In reviewing the results, we saw the importance of teaming for the best interest of the customer, sharing information, defining the process of making key decisions, and having a good interface with the customer.

In the first year of the pilot project, the idea of a “resource team” represented one of our most notable achievements. Comprising a subset of the Web companies appropriate for a given customer opportunity, the resource team would be pulled together by the BFTC to review an opportunity, and then develop the optimal solution for the customer. By participating on such teams, the members began to gain experience in working as cross-company teams. We were able to bid on real opportunities and to identify ways team members could work together to provide enhanced value to the customer.

As we moved into the second half of our first year, we entered a new phase in the project. It had become clear that the customers on the original pilot team were too concerned with internal issues to place real orders with suppliers they were not familiar with. Furthermore, responding to random RFQ’s was not proving to be a good approach to developing new customers. We began to evaluate our experiences for clues to appropriate business opportunities. We concluded that it was not worthwhile to try to compete for customers who were interested only in lower price on individual components already sourced elsewhere. Because the value-add of the Web is more pertinent to the design stage of the product cycle, we decided our point of entry had to be with high-level engineering and design people. This critical decision to market the Agile Web, while it made the project far more challenging than originally conceived, allowed us to broaden our system-wide approach and test it more stringently in the competitive marketplace.

In the course of dealing with customers, we learned that customers really want a single point of contact in dealing with a group of suppliers. This led us to consider a more formal structure for the Agile Web. In order to maintain accountability, facilitate inter-firm communication, and monitor project management and quality, some more permanent entity

was required. The BFTC proposed a corporate entity that would provide all of these, as well as maintain a core-competencies database, select appropriate resource teams, perform strategic marketing and business development, and target new business practices and improvement activities across the Web, even after the end of the pilot-project phase. Through discussion with legal advisors, we also learned that a formal corporate structure, with the members as shareholders, would confine liability on a given project to only those members actually participating in it. For all these reasons, we chose to pursue a corporate structure immediately.

Based on the experiences of our first year, we developed a business plan to address marketing, organizational, and strategic concerns. This plan highlighted aspects of the Agile Web which would differentiate it from its competitors. Among the most important were the wide range of equipment, process capabilities, and knowledge the Web possessed, as well as its willingness to collaborate to provide the best solution for the customer. Beyond just the combined assets of the individual firm, Agile Web--as an entity-- would also be able to offer the agility of an ever-changing, dynamic virtual firm, while retaining a permanent structure for long-term partnering relationships between the customer and suppliers.

In response to the business plan, the Agile Web companies formed three teams to address Entity, Marketing, and Operational issues. The members led these efforts themselves. We found that their having direct control energized each group and the Web membership, as a whole. This shift from learning and experimentation to the creation of an entity signaled a new phase in the project.

Under the Entity team, the plan for the Agile Web corporation crystallized. Agile Web would be incorporated as a for-profit C-Corporation, with each member granted one share of voting stock for the nominal fee of one dollar per share. Profits from each project would be passed on to the participants, leaving the entity's taxable earnings at virtually nothing. Each member would be liable for only its own work as a contracted supplier on a specific job. Agile Web, Inc. would be a low-overhead operation with only a single employee, the Web President. Anti-trust, the role of the Board of Directors and the Web President were also dealt with.

In addition to developing the corporate approach, the Entity team also developed an Ethics statement to guide the day-to-day affairs of AWI. The team strongly felt this approach was more agile than attempts to anticipate all situations that might arise and address them

contractually. Although legally non-binding, the document represented a commitment from each company to deal fairly with one another and the customer. Relatedly, the team also agreed on a dispute-resolution process in advance, to head off potential misunderstandings down the road.

The Operations Team developed a customer-response process. According to the plan, the Web president would pre-qualify the opportunity and the customer, and then would select a resource team to put together a proposal. The purchase order would be between AWI and the customer, and a Virtual Organization Agreement (VOA) would delineate the internal division of work, and its terms, between AWI and the Web companies. A simulated bid-preparation scenario was conducted to assist legal counsel in preparing a draft VOA.

While our legal advisers worked on the VOA, we employed a quality consultant to assess the individual companies' and overall Web systems, and to develop policy and procedures manuals. Based on his assessments and a series of customer surveys, he then worked with the Web companies to develop individual quality improvement-plans.

The third of the three teams, the Marketing Team, worked to define the Agile Web and what it was trying to sell. In their deliberations, the team began to see the value of selling supply-chain management, as well as the opportunity for AWI in the area of new product development. We also learned that customers need to change their mindsets, as well. Agile Web cannot be fully effective if partnering with the customer is not possible. To get to the appropriate customers, we sought to target more visionary, senior management, and we prepared a brochure, press-releases, and a logo and tag-line to convey the precise message of what the Agile Web is, and what it has to offer.

After the formal incorporation of AWI in June 1995, our attention turned to the challenge of proactively procuring appropriate business. The Board took steps to hire a permanent President to replace the acting president, on loan from BFTC. To enable us to take on production contracts, we foresaw the need for proper support systems. To address communication issues, we had begun to explore the use of electronic commerce. We also developed a system that would provide the ability to access and update a common database for project management, video-conferencing, interactive white-boarding, and shared applications. To help the group get started with these tools, we organized training sessions.

Usage among the members, however, was spotty. The companies usually resorted to the traditional methods they were already using in their "normal" business.

As we moved into the second half of 1995, the number of customer inquiries increased significantly, thanks to the publicity we had generated through press-releases. And at that time, we secured our first production contract, to be performed for a supplier to the Tobyhanna Army Depot. On the commercial side, we saw some encouraging signs despite the small number of real orders. A customer informed us that the Web had taken months off its normal development cycle. We did, however, confront some difficulties. Poor inter-firm communications hampered our customer interactions, and reinforced the need for better communications both inside, and between, the Web companies.

As relationships among the members grew, however, they developed more and more trust and confidence in each other. For instance, Web members continued to increase the amount of business they undertook with each other, outside of Web projects. We also began to see an increase in the number of Web members who were bringing projects to the Web for bids. Several members began referring work to the Web, even though their own firms would have no role in the project. We recognized that this major shift signaled that the companies were beginning to focus on their customer's total needs, and were now seeing AWI as a way to address them.

Some of the CEOs of the member companies began to realize that, to be successful in the Web, they had to have the support of their employees. Agile collaboration would demand different tasks and new decision-making skills from their workers. As activities increased, we began to see more employee involvement, and also initiated several efforts to encourage this trend. We conducted a seminar on self-directed teams, and then formed a committee to research the training needs of Web companies seeking to develop agile workforces. By this point in the program, we understood that changing the culture within and between firms, and strengthening the ability of their workforces to collaborate, represented the key to unlocking the value of the Agile Web. We contracted with The Davison Group, who proposed an innovative way to use multi-media to capture the change process, and thus facilitate the cultural migration process. We also began activities within two Web companies to create agile workforces. One involved a series of facilitated meetings between management and the

workforce to uncover issues essential to achieving a collaborative work environment. The other consisted of a mission-development exercise, led by the BFTC. In both cases, we have seen very positive developments.

The year 1996 saw the arrival of Bill Adams as President of AWI. In one of his first efforts, Bill proposed "client-development" teams as a way of proactively developing long-term relationships with large companies *before* they made a specific customer request. Bill's attempts at business development in this way demonstrated the need for individual Web companies, not just the President, to be able to present the Agile Web as a seamless entity. It also brought into sharp relief the difficulties involved in so doing. Accordingly, the BFTC/Davison Group team held several training sessions to coach and prepare the company representatives to act in a manner consistent with the Agile Web's message. These exercises proved valuable.

Bill also improved the marketing approach of Agile Web by pointing out problems with our current approach. The Web had often pursued commodity part, low value-add, RFQs in order to get some business. Bill suggested that the Web should propose a Web-oriented, high value-add solution, and ignore commodity-only opportunities. Instead of chasing any and all business, the Web should focus on developing relationships with a few good prospective customers.

With regard to defense business, our limited industry experience (only two Web companies were experienced DoD suppliers) placed us at an early disadvantage. Nevertheless, in our limited interactions with the DoD, we concluded that in the absence of procurement procedures that allow more long-term and collaborative relationships, there is little value Agile Web can provide beyond that of an individual supplier. Recent contracting processes now being tried by some DoD entities may provide the needed flexibility. Additionally, we see possibilities in teaming with existing defense prime contractors, who have a greater opportunity to establish and maintain ongoing relationships with the DoD. By supporting the prime in its efforts, the Agile Web can thus bring added value to the defense industry.

As Bill Adams worked to foster long-term relationships with some large customers, our attorneys finished the draft of the VOA. The VOA defined the legal relationship between AWI and the participating companies for a given customer job. Customers expressed interest in this

document because it was designed to document the liabilities of the Web companies when working through AWI on a given project. To our surprise, the Web companies raised many objections to the VOA. While many expressed concerns about the penalties outlined in the VOA for non-performance, The Davison Group helped us realize that their claims were masking more profound issues. These issues drove to the heart of the project: namely, how would the companies really work together on joint projects? To address VOA issues, the companies set up a committee which explored operational issues in some detail and, ultimately, generated a set of "Operating Principles." The Operating Principles, agreed to by the full membership, provided a guideline to direct Web member-to-Web member, and Web-to-Customer activities. Interestingly, even after adoption of the principles, members inadvertently continued to violate them. Thinking for the whole proved to be much more difficult to implement than to talk about.

Work on Quality and Technology systems improvements continued through 1996. Web Quality Policy and Procedures Manuals were completed. With regard to technology, however, progress was less straight-forward. Despite training and constant encouragement, usage of electronic communications remained limited. Technical difficulties were not the key factor; rather, the members simply could not be induced to use it. The lack of real business orders provided little incentive to allocate time and money necessary to learn how to use the technology. Accordingly, we re-directed our resources to the more critical operational and marketing issues. We did develop a core-competency database that Bill Adams is using to keep track of, and search competencies within, the Web, but the companies are not utilizing this to any great extent. We, thus, have reason to doubt that virtual firms can be formed solely through the development of a large-scale core-competency database. First, trusting relationships need to be built to allow firms to rapidly come together to work on joint projects.

As the pilot project came to an official end by December 31, 1996, AWI needed to shore up its own finances in order to make the move to self-sufficiency. The Board of Directors came up with a new approach. They determined \$10,000 to be the minimum contribution necessary for each company to become a full-scale member in AWI. Members contributing at least this amount would receive voting shares in exchange. Original members could retain a relationship to AWI by keeping their initial \$1 share, but their voting influence would be insignificant.

Members could contribute more than the \$10,000, with the excess going to a form of non-voting shares which entitle the owner to additional portions of any future dividends. In response to this plan, about one half of the original membership pledged financial support. This new organizational structure represented another step in the commitment demonstrated by the membership, and AWI is now a self-sustaining organization.

The Agile Web is still a work in progress, but early customer response has been good. We are finding that the concept is new to customers, and there must be time spent educating them on how to use the Web's services. As for the pilot project itself, we have learned a great deal about the barriers and benefits of small business collaboration in an "agile web". Based on our lessons learned and mistakes made, we believe a similar group of businesses will not have to repeat the experiment that we carried out. On the contrary, they can build on what the Agile Web has learned and achieved as they begin their efforts. The final section of our report provides some recommendations for others trying to replicate or build upon our experiences.

Recommendations for Replication

The final section of the report summarizes the lessons learned by the BFTC during the course of the project that are particularly important for others attempting collaborative activities. The first recommendation, is to have a clear and common understanding of the goal that the group wants to achieve. There are many motivations for and forms of collaboration between businesses. Joint efforts at training, purchasing, or sharing information on specific topics can benefit the participants, but they will be limited in their accomplishments by their charter. Such narrow efforts require less risk on the part of the participants, but also offer less potential benefit.

A commonly shared business goal can provide the incentive to risk new approaches and thus tap new opportunities. Some related suggestions include:

- It is very important to choose the correct mix of companies for a given objective. A balance of different approaches and perspectives can enrich the outcome, but will complicate the teaming process. Make sure that, at a minimum, all the key perspectives (industry, long-term versus short-term, strategic versus tactical, etc.) are

present within the team somewhere, or the group may never consider important alternatives.

- The commitments required of participating firms should be rendered explicit up front, so there is no misunderstanding after the organization is formed and in operation. A well thought-out assessment of a potential member's *commitment*, as well as its capabilities, is highly recommended.
- It is essential to choose companies that have CEOs who, themselves, can look for opportunities beyond their own company's capabilities, and who will also encourage their employees to look for additional opportunities made possible through a web.

The building of trust and confidence was the key ingredient in the success of the Agile Web. Initial efforts and the choice of participants should be predicated in part on this fact. If participants do not have a history of working together, they will require time to sort out their relationships and build trust. Even if they have worked together in traditional ways, getting them to increase the trust and codependency among themselves will still require significant effort. Face-to-face experiences are most helpful in sizing up potential partners. Geographic proximity, for example, will facilitate trust-building.

A good first step in forming an organization is the development of a business plan. This exercise should focus the team on where it can add value to its customers, and what activities need to be done to accomplish its goals. The process of jointly creating a business plan can be very effective in establishing consensus on a common mission. We have found however that a common set of words can often be interpreted far differently by different companies and people. Thus, it is important to have sufficient discussion at a detailed enough level to insure a common understanding. Talking about specific scenarios and examples is a good way to get this understanding. Action oriented entrepreneurs will resist this, but bypassing this step will only cause problems later.

Some further related points are:

- During the formation and early operation of the organization, the companies need to take ownership of directing the entity and not remain passive or just reactive. Particularly where publicly supported entities are leading the charge, partially for their own objectives, companies must provide leadership or the effort will die over time.
- It is recommended that even if public funds are initially available, companies look ahead to the time when the funds expire, and form their initial organization with that in mind.

One of the more important and difficult tasks for a collaborative web is to have each of the participating companies and all of their employees present their joint group as a single, seamless entity rather than a collection of individual companies. Changing this viewpoint to allow and promote collaboration can be extremely challenging, and ignoring this pitfall can lead to continuing misunderstanding and a breakdown in trust.

- We recommend that considerable training and discussion occur on portraying the Web as a seamless entity prior to formally presenting the Web to a major customer. Again, role playing and discussion of scenarios can be very valuable.
- Pricing can be a difficult issue. If one member tries to take advantage by charging higher margins, the group process will break down. In the case of AWI, all members had pricing policies proven in the competitive marketplace outside the Web. They all agreed to offer the same pricing to the Web. The Web President sometimes negotiated beyond this in collaboration with the members. In some situations, participants must be willing to be price competitive, even if only marginally profitable, to get business and develop customer relationships, so that eventually they can move on to high value-added projects. Finally, participants should examine their internal cost assumptions that may not be valid in a collaborative project.

- The establishment of a collaborative mindset and trusting relationships provides the springboard to the next level of performance in the marketplace. Once that leap has been made, additional incremental, but significant, progress can be made by the development and application of tools that allow the collaborators to operate more efficiently.
- We would recommend that the organization perform an assessment of the quality and information systems for each company to determine what is already there, and to establish a minimum standard for all to meet. Document these systems and develop common guidelines.
- Technology should not drive the new business practices; rather, the reverse should be true. We recommend that the business plan and operating procedures be established first, and then technology be used to improve the effectiveness and efficiency of the new practices.
- Recognize that there will be start-up costs required to reap the rewards of working together and developing new markets and new customers.

The Application of Agility

The landmark study, *21st Century Manufacturing Enterprise Strategy*, first presented the concepts of Agility to American business and government. The term Agility was coined to describe the captured common experiences of the many industry participants in the study. Their experiences made it clear that we were entering the next century in the midst of an ever-changing global economy. End users have more options when selecting products and services, and shifting attitudes place gratification ahead of loyalty. The users have increased their demands not only for higher quality, but for products specifically designed and produced to meet their personal needs. This has meant a shift from Henry Ford's mass-production paradigm—epitomized by the dictum, "you can have any color, so long as it's black"—to the idea of "mass customization," with product runs of one instead of thousands. Furthermore, the life cycle of even mass-produced products has declined rapidly, necessitating almost constant production changes.

The impact of these and other changes that are affecting the producers at the top of the food chain, naturally are being felt throughout the entire supply base. And the world of continuous change is not a comfortable place to be for most companies. While customers continue to demand constantly better and more customized products and services, global competition is forcing manufacturers to produce more at an ever lower cost.

For example, piece-part manufacturing has become increasingly transportable. Even complex, high-tech parts are now capable of being produced almost anywhere in the world with state-of-the-art processes. Even very small companies, who have previously concerned themselves only with a small regional market, are finding themselves competing in that market with competitors from around the globe. See Appendix A. Furthermore, their customers no longer have the time and resources to manage large numbers of suppliers, and they are looking for fewer suppliers who can take on more responsibility. Faced with both increasing customer demands and global competition, these small companies need an advantage, some differentiation, to retain and grow their business and to help their customers succeed.

With these trends in mind, the Ben Franklin Technology Center (BFTC) proposed to explore ways in which a regional collection of small to mid-sized manufacturers could collaborate using innovative and agile business practices to address new and expanded markets. We wanted to find out if and how such collaboration could provide an advantage to small businesses. By easily pulling together the competencies needed to address a market opportunity, a temporary or virtual collection of companies can collaborate rapidly to respond to a limited, but potentially lucrative, window of opportunity. By partnering to obtain access to pre-existing competencies rather than developing them, time-to-market can be dramatically reduced and a company's range of projects can be greatly increased. The value of concurrent engineering has been recognized for some time, but could it provide even greater value to the customer if it were adopted throughout the supply chain? The answers to that and many other questions are what we set out to find.

A number of other investigators have carried out projects to study specific aspects of, and develop defined tools for, agile manufacturing. Our pilot program took a different tack. Rather than look for incremental improvements that would speed up or enhance *standard* manufacturing processes, we chose to take a whole-system approach. We asked: How could we use the concepts of agility to guide us toward a dramatically different way of thinking and doing business? How could we make the next fundamental leap in performance? We sought, therefore, to address multiple aspects of the system at the same time, rather than develop a focused tool to address only a single process within the system.

After examining and thoroughly experiencing the current customer-supplier paradigm, we concluded that businesses fail to take full advantage of the assets they currently possess. In most part, this is due to the practices and systems that currently define the way they do business. Our experience is that companies rarely apply their core-competencies to the majority of their business. They often take in business providing services at which they do not excel, rather than strategically seeking out business that takes advantage of their real competencies, from which they can reap the greatest financial rewards. Customers often drive such an approach by treating each potential supplier as if their capabilities are identical and negotiating purely on initial purchase price considerations. This discovery is especially significant for lower tier suppliers who are accustomed to reacting to customer needs rather

than anticipating them through a strategic perspective. Our challenge was to determine how to unleash the value of a company's already-existing resources and unique skills and experience.

A second barrier to reaching the next level of performance is the failure to have all contributors work to optimize the whole product. What is valuable to the customer is reaching the optimal solution for the entire product or system. With each sub-supplier or even segments of a single company isolated from each other, every function or part is individually optimized without an understanding of how it fits into the ultimate assembly or system. How, then, can a company sharpen the focus on its true core-competencies, while optimizing the common goal at the system or end product level? It seems that the answer is through collaboration with complementary competencies of other firms.

The type of collaboration that we are describing, goes far beyond the traditional approaches of having one firm take the lead and sub out work to others. It is a peer-to-peer form of sharing based on voluntary co-dependency, and it is terribly risky. Each collaborative effort carries the risk of any member of the group destroying the existing relationship with suppliers and customers. The commonly accepted paradigm in use today holds that protecting your "trade secrets" and internal information prevents competitors from stealing your advantage and, thus, your customers. It requires a real leap of faith to abandon that viewpoint for the openness of collaboration.

In contrast to our initial expectations, we have found such tools as technology and common systems are secondary to reaching the next level of performance represented by the collaboration described above. There can be incremental improvements made by adding technology or increasing the compatibility of quality systems, for example, but such efficiency improvements will always be limited by the constraints of the existing process. What is required is collaboration akin to a team where the whole chain of customers and suppliers works together for the common goal, with respect for each other and each company's individual competencies.

Making that leap of faith entails risk. Those companies who have already made the leap internally through some form of empowerment often find it easier to collaborate externally. In fact, there are a range of skills that a company's people must acquire to collaborate effectively. It takes a very different point of view, for example, to see the whole of the customer's problem

and how competencies from outside the home company might be applied. Indeed, it is quite a departure even to seek out that understanding as opposed to just concentrate on what you know can be done in house. It is equally important to be able to recognize one's own internal competencies that traditionally have not been, but could be, sold as stand-alone products or added services.

These skills require real work to develop. It took time and practice and patience for the Web's members to develop a strong working relationship. As they did, it became clear that they were willing to make an extra effort for people they knew and trusted. Nevertheless, even after extensive discussions and agreement to act collaboratively, the Agile Web companies frequently fell back into the old paradigm of trying to do the whole job themselves--seeking to expand their involvement rather than optimizing the solution together for the customer.

Beyond the agile supply chain, the other critical part of the equation is the customer. The trend in recent years has been for companies to out-source more, while paring back the number of suppliers they are dealing with. Yet they still tend to treat suppliers as a "hired" capability to be managed in arm's-length fashion rather than as a team member sharing knowledge and responsibility to achieve a common goal. As leading companies learn to leverage the benefits of customer-supplier collaboration, they will overwhelm those firms who insist on the traditional power relationship between customer and supplier that was right for a time that has passed.

The key lesson of the Agile Web experience is this: the element most central to advancing performance, not by incremental steps but by a leap forward to the next competitive level, is the relationship of people that enables true collaboration. While we started out to address many elements of collaboration initially (systems, technology, etc.), the central challenge and chief focus of the Agile Web Pilot Program became the exploration and development of the people relationships required to create a truly collaborative entity. Once the new relationships, culture and perspective are developed, the technology and systems can be used to support them and further improve performance.

Although unplanned at first, our experience also led us to see the value of a formal structure for Agile Web for at least two reasons. First, it gives customers a single point of contact.

Agile Web depends on long-term relationships with customers and they prefer to deal with a “single entity” versus different firms for different situations.

Second, the Web structure provides a safe environment where companies can share information beyond their normal bounds in pursuit of joint projects. To do so, the Agile Web had to earn the respect of the suppliers, and also encourage their confidence in each other. Under the structure we adopted, employees of the Agile Web corporation itself “cross the line” between customers and suppliers to stand with the customer in “creating just the right company” to provide the needed requirements, and to change the make-up of that company over time as customer needs change. In fact, the “line” between customer and supplier will, in time, be eliminated.

Third, we found that small suppliers are opportunistic sellers, depending heavily on repeat business their current customers send their way. They are very good at figuring out how to do things or solve problems. Rarely, though, do they have the level of strategic vision, drive, and luxury of time to create new opportunities for themselves and their customers. Such strategic thinking has traditionally been the role of their customers. Agile Web helps fill that gap by providing personnel with the strategic mind-set and skills to proactively target business opportunities. Combining such strategic thinking with the well-honed tactical innovation of the Web suppliers leads to a powerful team indeed.

Although the formal project is now over, the Agile Web is still very much a work in progress. The road to successful collaboration and real-world business success is much clearer than when we began our pilot three years ago. Customer acceptance has shown that there is a market for the services for Agile Web, and it is growing. We have demonstrated that collaboration within Agile Web can provide enhanced value for customers. However, Agile Web, Inc. has only begun that journey. It is instructive, in any event, to understand how we reached the conclusions and recommendations we are espousing. In the next section of our report, we discuss the evolution of the Agile Web Pilot Program and, in doing so, hope also to convey the evolution of our thinking as events unfolded.

The Evolution of the Agile Web

Introduction

In the pages that follow, we will take a chronological look back on our experiment to share highlights and some lessons we learned in the process. Through our retrospective, we hope you, the reader, will be able to gain an understanding of the key relationship issues and new business practices that emerged during the project. One key development you will note is the project's evolution from a learning experiment into a for-profit business. This evolution is presented in such a way as to show how new practices worked, or didn't work, and how systems improvements were implemented. Initially, we felt that the experiment would be easy to facilitate. As you will see, it was much harder to implement this new thinking even with the most willing participants. New business practices and new relationships take time and commitment to develop.

Along the way, we will try to present the background and lessons learned in a way that will give you an idea of the activities and external events that affected the experiment and drove the transition to a specific business approach. Also, our review will pay particular attention to the key roles played by both public and private service-providing partners who assisted in the project.

An Experiment: Implementing Agility In Small to Medium Enterprises

A New Idea

The Agile Web Pilot Project began as an idea to implement agile practices in small and medium size enterprises (SMEs). In 1993, staff members at the Ben Franklin Technology Center (BFTC), a state-funded economic development organization in Pennsylvania, conceived and developed the basic concept, and formalized their plans in a Technology Reinvestment Project (TRP) proposal. The proposal, accepted by the TRP, had as its central aim to validate the premise that "cooperation enhances competitive capability." We at the BFTC set out to experiment with and to prove out the concepts of agility in SMEs because we knew that

competitiveness in the future would require manufacturers and their supply chains to develop new working relationships. We recognized that large firms were finding that many current suppliers were not able to meet their growing requirements. Small firms, in turn, felt that customers were foisting problems upon them without affording them the opportunity or direction to provide effective solutions. In addressing the customer-supplier issues confronting American business, we saw an opportunity to increase our nation's competitiveness, and to provide high-wage, high-skilled jobs for our citizens. We thought this could be accomplished by integrating new, agile business practices with time-honored American skills, culture, and resources in order to create a new, flexible, and cost-effective manufacturing system.

The BFTC has a track record of success with innovation and improvement projects, and we looked to some of our previous clients and collaborators to help us bring these new ideas to life. We selected 17 "Friends of Ben" to participate in the Agile Web. The companies were chosen because we thought they each, within their own enterprises, had demonstrated forward-thinking leadership, a desire to try innovative practices, and a commitment to develop new business practices and new working relationships. In addition, we also recruited several large corporations to serve as customers of the Agile Web's products and services. Finally, we identified several support organizations such as an Electronic Commerce Resource Center (ECRC), Industrial Resource Centers (IRCs), community colleges, and private consultants to serve in support roles for improvement projects that we foresaw taking place during the course of the project.

At its inception, the project included seventeen supplier organizations from Eastern Pennsylvania. The names and types of the companies follow:

<u>Company</u>	<u>Primary Service</u>
Allen Integrated Assemblies	Electronics
Banner Metals	Sheet Metal Fabrication
Blue Mountain Machine	Machine Shop
Blue Ridge Pressure Castings	Castings and Machining
Cook Specialty	Fabrication
Electro-Space Fabricators	Sheet Metal Fabrication
General Atronics	Design, Development, Manufacturing

Jade Corporation	Machining, Stamping, Rapid Prototyping
Kingston Metals	Sheet Metal Fabrication
Lamm's Machine	Machine Shop
MATCO	Electronics
Micro Tool	Machine Shop
New Standard	Stampings
Phoenix Microwave	Electronics
PS Group	Design, Engineering, Fabrication
Suckle Corporation	Sheet Metal Fabrication
SurTech Industries	Coatings

Improving Our Understanding of the Agile Web Companies

In the initial phase of the project, the BFTC staff conducted on-site interviews with the participants to understand their expectations and business perspectives for the project. We took every opportunity--including one-on-one visits, phone conversations, expectation interviews, plant tours, etc.--to listen to the companies and to gain an understanding of their perspectives and expectations, and to reinforce the goals and objectives of the Web. We needed this information to help us to facilitate the experiment.

We learned that even though all Web-member CEOs are forward thinking, they all had somewhat different objectives for joining the Web. The reasons ranged from having a desire to learn about and implement agile concepts to the desire to gain more business for their individual organizations. Even those who came to the experiment to learn indicated that they hoped to see some short-term economic benefit in return for their time and commitment to the project.

It is important to note that most of the companies were doing well with their current business. However, they recognized that supply-chain relationships, customer needs and competition were changing in ways they had a hard time understanding, and they wanted to be on the vanguard of that change. Because none of the players had any experience with the formal concepts of agility, and because the idea for the pilot was the BFTC's, everyone looked to the BFTC staff to set the agenda and determine the approach.

Moving forward from the early meetings in 1993, the project officially got underway in January 1994. Initially, the BFTC staff attempted to define the philosophy of the Web, as well as some basic operating principles in written form. The purpose was to have a baseline that defined the Web in terms of interactions with customers, formation of the best team to partner with the customer, and definition of the basics of operation for the virtual firms that would be created to respond to each customer opportunity.

In April 1994, we conducted a one-day CEO seminar to help the company leaders understand more about agility and how its principles could be applied to the Web. Dr. Roger Nagel, presently the Executive Director/CEO of Lehigh University's Iacocca Institute and co-author of several works on agility, conducted the session. The members reacted positively to the overview, and their participation indicated that the company leaders were ready to move their companies into the future and into the realm of virtual organizations.

As we worked to educate the members about agility and the common benefits for the participants in Agile Web, we concurrently worked to learn more about the individual Web members. Every bit of information we were able to learn about each of the businesses helped us to profile the types of organizations and cultures that could operate successfully in a virtual enterprise as well as better understand the resources available within the Web that could contribute to a Web strategy. To give us more feedback, we had each of the members complete a survey profiling his business. The details of the survey included corporate strategy, products and services, markets, unique capabilities, design and process capabilities, equipment lists, and quality achievements.

In addition, the BFTC staff worked with Dr. Nagel and Dr. Napoleon Devia, an Iacocca Institute Research Engineer, to research, identify and articulate the core competencies of the Agile Web. The goal of this activity was to understand competencies on a company-by-company basis in order to present them collectively to the Web customers. The agile concept of identifying and selling core-competencies, as opposed to peddling only existing products and services, was new to the Web members and, thus, required them to look at their businesses differently. As such, this was an important example of another new business practice for the Web members. See the first section of Appendix B.

This focus on core competencies also inspired those firms within the Web who might have perceived themselves as direct competitors with each other to take a closer look at their own strengths. By focusing on areas where they could differentiate themselves from other organizations, they became able to add significant value in problem-solving for their customers. Although we initially believed that several members were competitors and feared what impact that might have on relationships across the web, upon closer examination we found that, in reality, the companies' core strengths were not in exactly the same businesses. Despite some overlaps in the types of industries they serve, they all have specialties, serve different markets, and, thus, have different core competencies. For example, firms that at first glance appeared to be competitors, competing for sheet metal fabrication, could be in different markets, such as furniture versus computer, or one firm might be set up for high volume and the other for rapid response and prototypes of low volume. In addition, some may be high-precision and meet different needs than a lower precision firm. This knowledge helped to reduce the fear of teaming among participants who initially thought that another member might: (1) steal his customers or (2) learn something to use against him in the marketplace.

The firms began to learn that knowledge of standard industry practices, for example, is a core competency. The companies typically understood competencies as pieces of specialized, capital equipment, but, in fact, they are much more. Our core-competency reviews helped the firms think of their people and their knowledge and skills as key assets. We also discovered that values are at the base of core competencies. For example, if a CEO did not possess the value to team with other firms, he would not be motivated to put in place the procedures and opportunities to team. If a CEO did not hold the value that people should be empowered, he would not be able to function effectively as a member of multi-company, or virtual, teams.

We learned that different constituencies look at core competencies in different ways. If a firm is trying to team with another firm, their collective values may be more important than their process capabilities. Values and ways of doing business are critical assets of small firms. We examined the core competencies issue through a "union vs. intersection" analogy. For example, if one firm had a laser cutter, it could be stated that the Web has that equipment. Hence, the physical capabilities of the Web could be considered in terms of the *union* of all of their individual capabilities. With values, it is more complex. If only a percentage of the Web

firms empower people, we cannot say that the Web, as a whole, empowers people. Thus, the "values" of the Web consist of only the *intersection* of those attributes shared by every Web member. So, we can only say that an Agile Web empowers people if each and every Web company possesses this quality. A web is only as strong as its weakest link. Therefore, we had to carefully assess the characteristics and values of each of the Agile Web members.

The core competency review process also led to the realization that the Agile Web, as a structure, had competencies of its own, apart from those of the individual companies. That helped us to gain a systems perspective about what the Web can do as an integrated collection of core competencies.

While work on the core competencies proceeded, we also contracted with J. Mitchell Associates of Warrington, PA., to develop and perform a unique business assessment and review of each company. The one-day assessments were specifically designed to identify the strengths and weaknesses of the firms' internal processes from an agile perspective. The information helped us recognize where we could take advantage of the uniqueness of each firm to foster effective inter-company business processes. And, it gave us a starting point for systems improvements across the Web. For instance, we learned that some of the Web members did not have clearly defined long-term goals nor did they have a long-term strategies in place. We also found that some of the company leaders were not striving to grow their companies, but rather were concerned about maintaining their organizations at their present size. See Appendix C.

During the Fall of 1994, we obtained the business reviews conducted by J. Mitchell and Associates. These reviews produced a critical review of functions and operations at the company level, ideas about opportunities for improvement, an understanding of company systems that would work well with Web systems to enhance teaming, and a rating of each of the firm's business practices measured against the key characteristics of agility.

We also explored creating an agility-rating system based on J. Mitchell and Associates' business reviews. Our hope was to define a system that could be integrated with a software tool called "Visual Assessor," created by American Information Systems, a Pennsylvania software company. This combined instrument would have provided the firms with opportunities to measure and track their improvements in agility over time. It also would have

offered a graphical representation of the agility rating so that the firms could make comparisons to other companies in their quest for implementing agile practices. Although this activity heightened our awareness of the need to measure progress toward agility, we were only able to identify measurable criteria for the “hard” process and systems aspects of agility. We had already learned that the “soft”, relationship issues are significantly more influential and, thus, further work was abandoned.

Relationships: The Key to Moving Ahead

Although the project did not officially begin until the first quarter of 1994, representatives of the participating organizations began meeting in the summer of 1993. In those first months we sought to have the members meet as often as possible to get to know each other, to learn about the other individuals, and to gain some knowledge of the capabilities of each participating company. In addition, we hoped to share knowledge about “agility” so that the participants could implement some of these new manufacturing ideas in their organizations as they learned to work as members of a virtual organization. Early on, however, we recognized that the CEOs were anxious to define some actual business opportunities, and did not want to spend a lot of time discussing only the *theories* of agility. In fact, the design of the project was based on learning through real business experiences.

Utilizing feedback from interviews, reviews, and visits, we continually worked to attain the common vision that small firms, appropriately cooperating, can out-perform other small and large providers operating individually. The group proved to be very open to the general concept that we all needed to set aside individual objectives in favor of what was best for the group. They saw that in this way they could all be better in the long run. That vision, however, still lacked focus, and the group needed more work on how to implement agility and to work as members of a virtual organization. We realized that we needed further steps to help the participants get to know each other, to feel comfortable with each other, and to learn more about their fellow partners. In other words, we worked to develop *trust* across the membership. See Appendix D. The trust issue we were grappling with was not one of members worrying about other members being dishonest. Rather, it was more of an issue of their having confidence that all members would meet their obligations and not ruin the

reputation of another participant in the Agile Web. It became evident that trust would develop as the personal relationships grew, and nothing can take the place of face-to-face contact and conversation to build these relationships. Ultimately, strong relationships would only be developed by doing business with each other. The members had to understand the business values of their partners and their companies in order to build the foundation on which virtual firms could thrive. We at the BFTC undertook several initiatives to build relationships and address the trust issue. Some of the specific activities that we encouraged and facilitated included:

- An exchange of company literature and product samples
- Provision of basic address, markets served, product information sheets to each other, so that all of the members had knowledge of their partners
- Small group break-out teams during meetings for discussion sessions to facilitate more personal interaction
- Initial bid-opportunities to allow companies to begin working together
- Periodic regional breakfast-meetings with small groups

As a result of these activities, trust among the members did begin to develop, and the companies started to become more comfortable with each other. For instance, they began to use each other as vendors on non-Web projects. By working together and seeing how their partners reacted to different business situations, the Web participants had an opportunity to build trust and confidence, first by developing personal relationships and then by providing each other with products and services. We at the BFTC were pleased with these developments because we were already realizing the kinds of incremental opportunities often sought by forming consortia. However, our goal was to develop the next level of value creation. We could see that business practices had not fundamentally changed and the barriers and inefficiencies that characterize traditional supplier relationships were still there. At this stage

however, the trust level had not yet reached a point where members were willing to bring their own work and/or customers to the Web as a whole. They remained concerned about the risk of damaging relationships with their current customers that had been built over several years.

We held multiple meetings to encourage the participants to look at their business relationships. We wanted to help them develop the vision that they could contribute to a project through a "competency"--knowledge or skills beyond simply the products or services for which they traditionally charge. That is, we wanted them to see that they could contribute to a Web venture in ways different from those they typically had in the past. We asked them to consider their strengths, such as inventory-management, accounting, marketing strategies, industry knowledge, and employee involvement, and then to share these strengths with other members. We felt this would build strength across the Web by helping members uncover competencies within their own organizations, and recognize new ones among their associates in the larger group. Our experience reinforced our earlier belief that a huge portion of success depends upon the CEO's ability to translate the conceptual, as well as the practical and operational, aspects of the Web to his own organization.

For example, as we continued to work to understand the firms and to move the Web ahead, we conducted pricing/warranty workshops to assess how companies price their services, handle overhead and mark-ups, and manage warranty issues. Although the firms were willing to participate in the discussions, we found that at this point of the project, trust was not at a high enough level for the firms to feel comfortable discussing their financial systems with each other. They were more willing to share with BFTC staff in confidence, but this was a delicate issue.

An executive committee made up of CEOs representing a subset of the Web firms was formed to serve in an ad hoc leadership function to help us guide the Web, and to understand the company leaders' perspectives on the drivers and barriers to collaborating in new ways. The group met to brainstorm issues and to discuss some strategy alternatives.

As we moved into the second half of the first year, trust among the members continued to be the key issue in all that we did. The members were still reluctant to try to sell Web services to their existing customer base. We assumed that a lack of trust and confidence in other Web members underpinned this reluctance. The members seemed to fear risking their reputation

with their customers should another Web member not meet the expected level of performance. Hence, we felt that the ultimate expression of confidence would be a Web member bringing one of his own customers to the Web. Unfortunately, we did not have enough experience with live projects to build a sufficient level of confidence and trust to lead to this result until very late in the project, and that only happened in very isolated cases. The companies were keeping the Web activities separate from their core business activities. It was not so much an issue of *distrust* as it was a matter of not wanting to introduce many new variables into their core business until the Web was “debugged” and proven successful.

Although progress remained slow, the members continued to view the Web concepts--the new business practices outlined in our TRP proposal--as the way of the future, and they continued to commit significant time to explore and learn. And despite their reluctance to bring their customers to the Web, we observed that trust continued to grow. We saw members talking individually about business opportunities, and some began working together in standard business ways, again on non-Web projects. In addition, many started to express the importance of, and the willingness to share information about, their cost structures. They also showed progress in their understanding of agility and how cooperation could enhance their competitive positions. We learned that, while it takes time to build relationships and trust, personal relationships are essential to drive the process of virtual-enterprise formation. To nurture those relationships, we recognized that it was important to provide opportunities for the Web members to interact and discuss key issues.

Through early Fall 1994, some Web members continued to work on business opportunities with other Web participants. Although the opportunities were not generated by the Agile Web, per se, and did not involve all of the firms, they helped us to begin to understand how companies partner for new opportunities. These opportunities also helped the Web members discover the application and benefits of teaming for the customer. However, these member-led partnerships still tended to preserve traditional prime contractor/sub-contractor relationships.

Simulating Real-World Experience

Since none of our projects had moved into the production phase, we developed an extensive simulation exercise to give the members the experience of the entire process from the receipt of the Request for Quote (RFQ) from the customer through shipping the final product. Prior to the actual simulation, we conducted a pilot run of the process with the BFTC staff and some of our service providers. The developer of the simulation, Flavio Corrocher, an Organizational Behavior Consultant, suggested the trial run to verify that we would trigger the types of interaction and role playing that would make the exercise useful for the participants.

The full-day Web simulation was held in October 1994 and provided a great opportunity for the members to learn from the experience and from each other. It began with a simulated customer preparing and submitting an order to the Web. Each CEO represented a company with competencies defined by the simulation. The Web members then determined who would participate in the response to the customer. We formed the virtual organization, or "resource team." The firms then set up production and delivery systems to actually make the product (a paper fan blade) for the customer to accept or reject. After delivery of the finished product, we evaluated each phase of the process in terms of the agile attributes displayed. We reviewed the creation of the virtual firm, bid preparation and acceptance, the production process, and customer-service issues—such as design changes, delivery, and quality. Finally, we spent some time on training related to interpersonal and team skills.

The exercise was very useful in helping Web members see the changes that would be required in their thinking (e.g., sharing and teaming) for the Web to be successful. In fact, the process was so well received that, had we recognized the value of this type of exercise sooner, we would have conducted it earlier in the process. Some of the lessons taken away from the session included:

- The participants were able to see the benefits of teaming in the best interest of the customer.
- To truly come up with the optimal collaborative solution for the customer, sharing of information, such as cost structures or currently available production capacity, proved essential.

- Trying to give every member of the Web some portion of the work may not result in the best solution for the customer.
- Defining the process of making key decisions quickly emerged as an important issue in making a Web work.
- Good communication and collaboration were critical to providing quality products, and could result in cost-saving improvements to the production processes.
- Good interface with the customer was absolutely essential to understand his needs and to propose value-added beyond “build-to-print” services.
- The role and the skill-set of a coordinator was critical in getting the group to come to a good solution quickly.
- Participating in the Web was an investment in learning how to prosper in the business environment of the future.

In addition, we at the BFTC continued to coordinate a number of Web meetings for suppliers, customers, and service providers to get together to build relationships, discuss business opportunities, and address new business practices. As the Web members began working together, we recognized that these sessions needed to include only the Web members, in order to give the representatives more time to build relationships without the distractions of service providers and customers. We did not want to discuss the pros and cons of the evolving organization in front of our customers.

Marketing Issues

In the course of six months of “orientation” and relationship-building, the Agile Web had also worked on nine trial projects. At this stage we were also able to break new ground with the idea of a “resource team.” This team would be pulled together by the BFTC staff to review a

customer opportunity, and then to develop the optimal solution for the customer. They were our first attempts to get the Web members to begin to think as cross-functional teams solving a customer problem versus individual providers bidding on their portion of a job. When questions arose about which of several Web members in a given industry should do part of a job, rather than bid against each other and have BFTC select the “winner,” BFTC staff attempted to work with each company to determine which firm, or combination of firms, could do the most to satisfy the overall customer need. Unfortunately, none of these initial customer activities turned into specific orders. Given the status of Agile Web, the only real jobs we could obtain were open quotes on projects similar to what the individual member had traditionally satisfied, rather than more value-added projects. There were responses to customers only looking for costs lower than they were currently getting from long-term suppliers. We found that these customer were too consumed by internal issues and pressures to do anything unique with the Web. Despite not producing any real orders, these bidding experiences raised important operational issues such as determining profit margins and establishing accountability for delivery.

In addition to helping the membership get to know each other, the bidding opportunities helped the participants to focus on new opportunities and new business practices. We recognized the need to develop these practices in the context of live orders because firms of this size do not ordinarily have the opportunity, nor the resources, to learn practices from a conceptual vantage-point. The Web members needed the opportunity for real-world implementation. They were able to get to the real issues of how to do things differently only by experiencing partnering-issues within a real business context.

Although the traditional bidding opportunities helped the learning process, we reached a point where we knew we needed more orders for our experiment. It was important to target markets more suitable for Agile Web and to recruit business in those markets. Recognizing that we would need to move forward with a new strategy, we initiated a number of efforts to position the Web for such opportunities. Contrary to our initial expectations, our original large corporate partners were not providing project orders to let us experiment. Although they originally intended to work with us to learn more about implementing agility in their supply bases, as we got underway they expressed uneasiness about quality systems, operational issues,

and the actual benefits of dealing with an Agile Web. Unfortunately, they did not take the opportunity to look at new ways of dealing with their supply chains.

In the absence of captive customers, we contracted with a management and marketing consultant, Dale Falcinelli, to help us develop a strategy to market the Web. As we sought assistance from Web members, it became clear that small and medium-sized enterprises are very good at responding to customer's requests with specific products and services, but they typically do not market strategically. Sales were carried out through several different methods, including independent agents, in-house sales departments, and largely through the owners themselves. The one distinguishing characteristic throughout the Web, though, was a reliance on repeat business from a relatively small customer-base, developed through prior relationships. Therefore, we needed to go beyond the sales and marketing skills that were available through our Web members. Because of the time constraints associated with the project and the need to experiment in the context of live orders, we hoped to begin implementing a marketing strategy within three months.

Meanwhile, the Web continued to look at ways to better present a single front to a customer. Based on feedback from customers, we learned that they highly valued a single point of contact with any supplier. The challenges inherent in presenting such a unified response resulted in another new business practice, insofar as firms were now willing to subordinate their own interests to the interests of the Web.

Significant work continued through September in the development of our strategic marketing plan, enabling us to identify a unique market niche for the Agile Web. We concluded that it was not effective for the Web to compete in situations where a customer already has a cost-effective supplier and his only goal was to drive down the cost of a specific component. The Web's unique capabilities suggested that if the Web could get involved earlier in the life cycle of a customer's product--such as in the design phase, the prototype, or initial-production phase--the possibility of providing much greater value-add to the customer would be unleashed. The Web would then be able to value-price its services and improve the profit margins of the Web members. We confirmed this strategy by contacting companies that fit into our proposed market niche.

By the beginning of Fall of 1994, we had identified a unique market niche that the Web could target. We believed that the Web was positioned to provide high-value, wide-capability design and manufacturing services to customers who need:

- Easy access, through a single source, to capabilities and capital equipment that can solve a wide variety of problems
- Collaborative refinement of an entire product
- Initial manufacturing of a product to be done without interrupting the customer's existing production lines
- Constant product enhancement, refinement, and customization

Working with our marketing consultant, we also identified the following potential customer bases:

- Fortune 500 companies that do significant development of new products with special high-end features or high customization (Potential customers could be easily identified for this market)
- Mid-size manufacturers that need expertise to refine or redesign their product and want to focus on providing enhanced customer services (Referrals, networks, manufacturing associations, or mass marketing would be used to identify these customers)
- Start-up firms that have new products that they need to get to market very quickly, and who want to reduce or delay capital investments (Customers would be found by networking with venture firms and banks)

It was clear that the broad range of capabilities and expertise held by the firms in the Web, along with the ability to pull them together quickly and flexibly, would provide more value to the customer if the virtual organization partnered with the customer early in the product life-cycle. There appeared to be a market for the Web in the area of new-product development. Agile Web could help in the design process and then manufacture the product for a year, or so, while the manufacturing processes are debugged and the customer re-tools for the new product. Because the value-add of the Web is more pertinent to the design function and to those who are looking for systemic benefits, we recognized that our point of entry had to be with high-level engineering and design people, and not with procurement groups.

In the course of working with the firms on assessments and core-competencies, we began to identify several new business practices to support virtual-enterprise formation. Our evolving marketing strategy suggested that we had not properly screened several business prospects and, consequently, ended up wasting time for the Web companies and our staff. To prevent this from happening in the future, we developed a process to qualify a prospect before the web members wasted any time preparing to bid a job for which our collection of companies was ill-suited. See Appendix E. The process involved:

- Qualifying the customer as one with which the Web wanted to work
- Qualifying the opportunity from the perspective of projected revenues for the Web
- Insuring that the Web had the capabilities, or could find the capabilities, to carry out the job

As we developed our marketing strategy, other key lessons emerged. Among the most important was the recurring fact that, in dealing with a web of companies, new customers want a single point of contact. Existing customers of Web members and most Web members wanted the point of contact to remain between the member and his customer. Only a few Web members were comfortable with their customers working through other Agile Web participants. This led us to consider a more formal structure for Agile Web.

A Structure for the Organization

The BFTC staff sensed that the activities over the prior few months had not been driven the Web companies themselves. While the meetings--and to an even greater extent, the simulation day in October--continued to increase the trust and confidence level of the Web representatives, it became obvious from discussions and meeting evaluations that the project lacked a driving focus.

Throughout most of the life of the project, an underlying debate had continued concerning the nature of the Agile Web pilot. Many saw the Agile Web, originally presented as a test-bed in which to try out various concepts of agility and related business practices, basically as an experiment. From this viewpoint, the various participants would come together as required to work on customer projects brought to the table by the BFTC staff or, perhaps, even from a Web member. Various agile methods would be developed and tried out for each project and the results noted. Based on our experiences, we would then refine our approach. At the end of the pilot project, we would have determined which concepts, methods, and technologies worked best.

This might well have been the direction taken had our original plan--to produce several iterations of the same products for a number of large participating customers--come to fruition. In meetings prior to submitting the proposal, the participating customers had identified some types of items that caused them problems with procurement and would be good for testing the Agile Web. However, we discovered that these firms were going through major changes of their own, and they were reluctant to try a new (and potentially better) approach unless it was guaranteed to work. In other words, the Web would have to actually win business in the competitive market before we even would have the chance to produce anything. This caused our thinking to evolve.

Early on, one of our customer participants pointed out there was a problem working with an amorphous virtual organization having no central point-of-contact or permanent entity to go back to, should some problem arise. Who, in fact, would be sent the Purchase Order? Who would be held accountable? Furthermore, during the simulation, it became apparent that for the Web members to work collaboratively in a specific virtual organization, a great deal of communication would be required. The virtual organization would need a rapid and reliable

means of communicating engineering changes and quality problems in order to operate efficiently. During the simulation, the coordination of that communication was led by one of the BFTC staff members in a role we affectionately dubbed, "Web-man."

So from an early point in the project, the structure of an organization presented an important area of concern. We explored how an organization might be set up to support the Web beyond the time-frame of the TRP program. It was at this point that the thinking about the transition from experiment to a more permanent organization, an independent entity, began to occur. We started thinking about the importance of marketing in this light as well. Members of the Web recognized the strong need for the marketing strategy to get business immediately--not just for profit's sake, but to establish a market and gain the necessary experience in forming and operating virtual enterprises in order to enable the Web to continue beyond the TRP Project.

BFTC staff members and the Web leadership board discussed the formation of a corporate entity and the value-add such an organization could bring to the Web. The key driver was the need to have a single, legal entity for the customer to deal with. We also had seen that Web members would not have the time or resources to know and keep up with the core competencies of all of the other members, especially if members change or the membership grows. The entity could provide the core competency of maintaining this information and thereby facilitate the selection of the appropriate "resource teams." We felt that a corporate entity could add competencies to the collection not present in the members. In particular, small firms do not perform much strategic marketing, and business development, and a collective entity could provide this function. The entity could also be responsible for targeting new business practices, creative ways of combining core competencies, and improvement-activities across the Web firms. Finally, an entity would serve as a more formal sign of the commitment to work together.

We envisioned this new venture as a for-profit company to provide the following value-added services:

- Fulfilling the strategic marketing role for the Web
- Screening and pursuing appropriate business opportunities

- Serving as a single point of contact for the customers
- Being fully knowledgeable and up-to-date with all of the core competencies of each of the Web members, especially as the membership expands and contracts
- Being able to facilitate creative packaging of core competencies for specific customer opportunities
- Being the entity charged with making the day-to-day decisions as required, including which firms should partner to meet customers' needs
- Looking for and suggesting new business practices and creative ways of combining core competencies, as well as identifying systems improvements that need to be made within Web-member firms or across the Web
- Identifying the lack of core competencies in the Web and looking for new firms that could fill those voids
- Providing the organizational stability desired by the customer, while at the same time being able to form virtual firms for rapid response

It was at this juncture that the BFTC staff began building upon what we had learned to date to form a business plan to provide some overall direction. To be able to perform the roles defined above, the entity would have to:

- Create an environment of mutual support between the Web and its members so that each sees greater business advantages in working together rather than individually
- Provide a basis for legal protection without losing flexibility or the ability for the system to respond quickly and creatively

- Operate with minimum cost
- Be able to generate its own revenues to cover operating costs, with excess revenues being passed on and shared by the Web

Legal Issues

Clearly, there was a need for a single and permanent point-of-contact, close communication and project management, legal protections discussed earlier, and strategic marketing drove us to consider the creation of a new Web entity. Since this was a fairly large departure from the initial expectations of the pilot participants, the BFTC staff made a special presentation of the new concept to the Agile Web's Executive Committee at the beginning of November 1994. The general feedback was positive, although the group expressed different viewpoints as to how new business practices should evolve. Some members thought that the BFTC staff should present "straw men" for the Web to emulate and modify as needed. Others saw the Web members themselves driving the development of agile business practices through the opportunity to work together on real business.

Encouraged by the favorable response of the Executive Committee, the staff presented the plan to all of the Web companies in a series of regional meetings later the same month. The 'plan of attack' for the Web that we presented focused largely on obtaining new business. It was proposed that the BFTC staff would act as a Web "entity" to pursue the appropriate niche market opportunities as defined by the marketing study, while Web suppliers would be encouraged to bring their own customers either directly to the Web, or at least to utilize other Web members as sub-contractors to build a level of confidence. In exchange for BFTC help in obtaining this new niche business and other less-tangible benefits, such as learning new opportunities, the Web companies were asked to agree to be open to experimenting and sharing information, so that we could test different agile business practices.

The feedback from the regional meetings was positive, so the BFTC staff began a concerted effort to produce a model for presentation to the Web members at a meeting in January 1995. As mentioned above, we decided to write the proposal in the form of a business plan, a

practical format familiar to the entrepreneurs that made up the Web. The resulting document addressed a number of pertinent issues.

To understand the issues associated with the creation and operation of different business structures, we began discussions with Jeff Libson of the law firm, Pepper, Hamilton, and Scheetz, who has extensive experience in new business start-ups and partnerships. He helped us to understand that our informal structure was actually a disadvantage to the Web under US law. In the absence of a legal structure established for the Web, the courts would likely interpret the group as a legal partnership. This meant that if a subset of the total number of firms worked on a project together, and a lawsuit followed, the entire Web could be liable. A corporate model for the Agile Web, however, would confine the liability to only those companies involved in a project, and would thus protect the remaining members. Members involved in a project would still have the same liability as if they were a supplier in a traditional contract. However, being a Web member would not add additional liability as in the case of a partnership. In order to move the corporate structure closer to reality, our next step was to document the characteristics and operating practices of such a new corporate entity. As part of our deliberations, we considered whether the entity should be formed during the TRP pilot phase, or whether it should follow the completion of the project. We concluded that the Web needed the advantages of the corporate structure immediately, and pursued its development.

Legal counsel also pointed out that Web members, when discussing the particulars of a specific job, could legally share their cost and pricing information. They would have to be careful, however, not to share *general* cost- and pricing-information. In order not to run afoul of price-fixing regulations, the Web should be reminded annually by legal counsel of these caveats and other specific legal stipulations pertaining to anti-trust.

Sharing and Learning

Towards late 1994, we began to share our progress with other similar activities taking place on the national and international scene. Our staff members began to meet with four other TRP groups in order to share lessons-learned and, we hoped, to increase all of the projects' potential for success. It was a great opportunity to exchange ideas, discuss common issues, and learn from each other. It also helped us to examine how we were presenting the Web and how we

might differentiate ourselves from other programs, both within and outside of the TRP. A matrix was generated that compared our Agile Web with other types of organizations. See Appendix F.

The Plan Comes Together

The Business Plan was written by the BFTC staff based on the experiences of the first year and the advice of our marketing and legal consultants. Presented at the January meeting as a draft document, it addressed marketing, organizational, and strategic concerns.

The Marketing portion of the plan adhered, for the most part, to the proposal from our consultant, Dale Falcinelli's, recommendations. The staff highlighted aspects of our plan that would differentiate the Agile Web from competitors, including other similar-looking networks as described in the matrix previously discussed. The strengths of the Agile Web companies included a wide range of equipment, process capability and knowledge, and a willingness to collaborate. We felt that the familiarity of the group as a whole across a wide range of industrial sectors and customers would provide a benefit in two ways: access to many customers, as well as the ability to draw on the many different industry paradigms to solve a specific customer problem.

Perhaps more significant in distinguishing the Agile Web from its competitors, however, were the core competencies of the Agile Web entity itself. First, it could act in the customer's best interests in proposing the optimal mix of Web competencies to solve a particular problem. With the ability to compare the benefits, for example, of casting versus stamping, machining, or injection-molding a part, the Web could provide a service for the customer that traditionally would have taken him considerable effort to do himself or, more likely, wouldn't have been done at all. The corporate Web entity would also provide the single point of contact desired by most of the customers we had interviewed.

The Agile Web entity was seen as one method to resolve the seeming paradox between the agility of the ever-changing, dynamic virtual firm, on the one hand, and the desire for long-term partnering relationships between customers and suppliers, on the other. The Web entity would provide the long-term partner for the customer, while constantly re-configuring the specific competencies and companies that could best respond to a customer's current requirements.

The Agile Web itself would hire and develop resources with skills in strategic marketing and sales. It would also be the repository for a comprehensive knowledge of the Web's collective competencies. This knowledge-base would then enable the Web to pull together the appropriate resource team to address a customer's problem.

The business plan also stressed the Agile Web's unique position vis-à-vis its potential competitors, from the vertically-integrated single company through the traditional and enhanced single-industry supply chain to other cross-industry webs. Some of the advantages of the Web we identified were:

- A more strategic approach, tapping multiple experts as a first choice rather than only when required;
- More innovative solutions through exposure to various industry paradigms;
- A pre-structured infrastructure that allows rapid response, ease of communications, and proactive partnering; and
- The focus on providing extra value by tapping and organizing expertise and competencies normally left in their own silos.

We recognized that the Agile Web model was not the only way to create an agile supply chain, but it worked well for a cross-industry group focused on rapid customer access to a broad range of skills and services. A single-industry supply chain serving a major customer or industry (e.g., the automobile industry) might be organized and driven much differently. Whatever the structural form, however, any such collaborative effort will likely face similar issues and, thus, should benefit from the lessons learned through the Agile Web pilot.

The most significant new ideas to come out of the process of preparing the business plan resulted in a proposal to incorporate the Agile Web and a description of how such an entity would operate. The specifics of this structure will be discussed later, but the key concepts emerged in this early period. These included the basic idea of a for-profit C-Corporation led by

a strong, strategically-oriented president and having an easy-exit policy based on avoiding the growth of equity in the corporation.

The BFTC viewed the proposal to incorporate as a requirement that the whole group step up their commitment and involvement a notch. We were pleased, therefore, to find the whole group willing to continue. In fact, presenting the proposal as a business plan seemed to make sense to the more tactically-oriented problem-solving entrepreneurs who made up the Web. The group seemed ready and willing to address the issues involved in establishing the new structure. At the end of the January meeting during which the proposal was presented, the gathered representatives formed three teams to address the major topics of:

- The Legal issues surrounding the formation of the Entity
- The Marketing plan and its implementation
- The Operations of the entity

Although assisted by the staff, for the most part *the members led these efforts themselves*. Working on concrete business issues greatly energized the group, and we made a good deal of progress over the succeeding months. Before continuing with the results of those proceedings, it is important to keep in mind other concurrent events and activities that provided a backdrop to these more visible initiatives.

Agile Web Committees

The three teams previously discussed were formed by the Web representatives themselves. After two months of face-to-face and telephone conferences the Entity, Marketing, and Operations teams presented their recommendations to the entire Web.

Entity Issues: Developing an Optimal Structure for Virtual Enterprise

After extensive discussions with our legal advisor, the Entity Team recommended an innovative structure for the Agile Web using standard contract and corporate law in creative ways. The Agile Web would be incorporated as a regular for-profit c-corporation, with each member of the Web granted one share of voting stock for the nominal fee of one dollar per share. See Appendix G. The plan was to create an entity which, while owned by the members, would provide no value through ownership alone. Each member would have an equal voice.

The contract with the customer would be with Agile Web, Inc. (AWI), and AWI would build in a fee for its added services. The profit derived from each contract would be passed through to only the specific members who provided value to that particular project. Agile Web, Inc. would retain just enough of the earnings to cover its minimal expenses, leaving the entity's earnings and tax liability at virtually nothing.

The lack of equity would allow members to easily drop from the Agile Web in the event they became dissatisfied for any reason. With only one dollar invested, there would be nothing to prevent a dissatisfied member from leaving. The existing members could decide who could buy the one dollar share, thus controlling membership. Further, they could ask non-performers to leave by buying back their share.

Each member would only be liable for its own work as a contracted supplier on a specific job. There would be no additional liability solely for being a member of Agile Web. Finally, the Entity Team intended AWI to remain a low-overhead operation, starting with only a single employee who would serve as the Web President. A BFTC staff member, Ted Nickel, agreed to fill the president's role until a permanent employee could be hired.

Anti-trust presented an important issue, and the team explored it carefully. The companies of the Agile Web, even as a collective group, do not capture a significant share of any one market to the point where their collaboration would be considered a monopoly. Therefore, AWI need not worry about violating anti-monopoly provisions. There is, however, a specific prohibition regarding price-collusion that is not dependent on combined market share. It was determined through a formal legal opinion that Web members were free to discuss their internal costs and pricing on a *specific project* to which they were responding as a virtual organization. The discussion could not, however, address their *general* pricing policies used in their business affairs outside of the Agile Web. See Appendix H.

Rather than control prices and *inhibit* competition, the intent of Agile Web, in fact, is to *increase* competition by allowing more companies to address projects that would have remained beyond their reach as individual companies. Since Agile Web did not intend to seek work that could be easily done by a single firm internally, the several machine shops in the Web would still be able to compete with each other as they had always done for machine-shop type jobs. Furthermore, the easy-exit policies allowed any member who felt his ability to compete

was inhibited by membership to rapidly disassociate himself from the organization, and compete for future work--but not for work already under development by AWI.

The business plan called for AWI to be run by a Board of Directors, a majority of whom were to be representatives of the participating companies. The Entity Team considered a board consisting of a representative from each company, but this was judged unworkable and too clumsy to be agile. To further enhance the Web's responsiveness, the team adamantly favored a strong president to run the day-to-day operation of the company. They felt that rapid response depended on the ability of an objective third-party president to make final decisions regarding the members of each virtual organization. It was recognized that there would be a co-dependent relationship between the President and the members. The President had the authority to move rapidly without waiting for a committee decision. However, if the members disliked his decisions or manner of making them, they could refuse to participate, leave the Web, or even select a new President. Hence, they vested the president with the necessary authority to select resource teams at his own discretion. While certain key decisions were retained by the shareholders as a whole, the trend was to push decision-making to the Board and, ultimately, to empower the Web President.

One idea that came completely from the team itself was the Agile Web Ethics Statement. See Appendix I. As the team discussed issues that might arise in doing business together, it became clear that dealing with all of them would lead to a structure so complex as to be non-agile. Instead, team members recommended that each company sign a legally non-binding statement of ethics that they commit to using in all their dealings through the Web. In effect, this document was the equivalent of a "handshake" deal between the members to deal fairly with one another and the customer. The Web members owners, proprietors of small businesses, were comfortable with this solution, which might never have survived a corporate legal department review. Since anyone could drop out easily or be removed from the Web through a specified process, it was felt that no further penalties were required.

The one contentious discussion of the team was in the area of dispute resolution. Initially, the team recommended a procedure using an internal conflict-resolution group to mediate and resolve any disagreements between members. After some discussion, the group felt that such a procedure, if used, would create too much ill will for the company to continue. They felt a

third party--either in the form of arbitration or actually in the courts--would be a better choice. In fact, while arbitration was eventually chosen, a minority view held that relying on the courts--with the resultant high cost in time and money--would provide a strong incentive to working out problems informally.

Operations: Thinking About the Logistics of Virtual Enterprise

The Operations Team identified a number of issues, and immediately began thinking about how to address them. Based on their experience with the Web thus far, the team was able to lay out a customer-response process in some detail. The Web President would pre-qualify the opportunity and customer, whether projects came to the Web directly or through a member company. After notifying all Web members of the project through e-mail, the President would then select a resource team to put together a proposal to the customer. This would give the Web members a chance to comment on the opportunity or on any previous relationship they might have had with the potential customer. The purchase order would be between the Web and the customer, and a Virtual Organization Agreement (VOA) would spell out the internal division of the work and its terms. See Appendix J. The Operations Team planned that the Web members would always be given first choice to participate, provided they had the necessary competencies, before any non-member firms were asked to participate in a project. As a rule, non-member firms chosen to fill a competency the Web lacked would be suppliers already well known to one or more Web members and recommended by that member.

Compensation would be based on each company's contribution, with each offering services to the Web internally at its "normal" mark-up. Compensation provided for design or process ideas as well as production. The President would tack on an additional charge to cover Web expenses plus any additional charge that the market would bear to reward the value added by the Web. Finally, warranties and liability would be assigned to the virtual firm participants involved in the specific job through their sub-contract with the Web.

In addition to the VOA, the Operations Team suggested tools be developed to monitor the progress of joint projects and to ensure an acceptable level of quality throughout the Agile Web. The team discussed the value of ISO 9000 compliance and registration, but reached no consensus. Many of the companies have found that their key customers prefer to conduct

individual assessments rather than accept ISO 9000 standards alone. Quality thus represented another instance in which the individual company's core business drove their level of interest in specific improvement activity.

Honing our Operations: Innovative Contractual Approaches Quality in the Agile Web

In succeeding months, the Operations Team moved on to focus on two key items: the Web's Quality program and the generation of a standard agreement to be used by members when forming the multi-member teams into a virtual organization to respond to a customer request. This standard agreement for a virtual organization (VOA) defines how the member companies cooperate, and what their responsibilities will be. When a customer contacts the Web, its needs are almost always capable of being met by a subset of the total number of companies in the Web. In fact, we have not yet seen a project that would involve all of the Web members. Given this fact, AWI responds by picking a handful of companies from the Web, whose competencies match the customer's needs. This subset of the total Web organization, called a "Resource Team," then gathers together to respond to the customer's needs. We envisioned the VOA as a way of spelling out the responsibilities of each member of the resource team that makes up the virtual organization. The Web's legal counsel was charged with generating a rough draft of the VOA. Counsel would present the draft of the VOA to the Web members for their approval at a later date.

One of the unique advantages of the AWI corporation is providing a stable entity for the customer to work with, while at the same time, through the VOA Resource Team, allowing for a rapid-response team to assemble, solve the customer's needs, and move on to other opportunities. Unlike other models of the virtual organization, Agile Web does not completely dissolve after delivery, since the companies remain part of the permanent AWI corporation. This gives the customer a longer-term vehicle to address issues such as warranty, engineering changes, defective parts, and future projects.

The Operations Team provided their most valuable input as part of a process to develop a standard Virtual Organization Agreement (VOA). Trying to identify as many of the issues that needed to be covered by such an agreement as possible, the BFTC staff designed a simulation using the members of the Operations Team as the Virtual Organization (VO). In order to

create as real a situation as possible, the owner of an electronics firm outside AWI was recruited to act as a customer seeking to out-source the production of a new product. With a real businessman (with a realistic product) in the customer role and the Web members and acting Web president playing themselves, the exercise was much more real-to-life than the previous simulation.

The purpose of this simulation was much different than the October exercise described previously. That one focused on building relationships between members and identifying mindset changes members would have to make to be successful, but this exercise sought to dig into the details of how members of a virtual organization would divide the risks and rewards. As the simulation was played out, our legal advisor and several other observers recorded the issues raised and the resulting conclusions reached by the group. One interesting conclusion did result. The customer we recruited had doubts as to whether the Web participants would really collaborate effectively, so he designed hidden issues that would only share if different members compared notes on their respective roles and how they would integrate. To his surprise, the team did surface and respond, indicating the value of true collaboration. While the design of the simulation did not allow for a realistic appraisal of cost and pricing issues, a host of other considerations were raised to form the basis for the actual VOA document developed in 1996.

Web Quality

For the Quality issue we sought an external consultant who could gauge the current quality-level of the Web members and help them learn to assess themselves through the use of a software program called the Visual Assessor. The consultant, Sam Schaadt, a certified ISO auditor chosen for this important task, came with an excellent background and set of credentials, having been named as a Fellow of the American Society for Quality Control (ASQC). Developed by American Information Systems, Inc., the Visual Assessor has an easily understood graphic format. With the assistance of our consultant, we installed the software at the Web members' sites and walked them through a sample audit. This allowed the companies to perform an ongoing evaluation of their current quality programs at their own pace.

We also asked the consultant to develop a set of manuals for quality policy and procedures that would document the Web's quality system. See Appendix K. Some, but not all, Web firms supported developing a minimum-level quality system across the Web. We hoped that such a system could eventually be used to demonstrate the Web quality systems. The individual assessments soon revealed, however, that requiring each Web member to adopt the exact same quality system did not make sense. There was too much variation across the firms to expect all to change. Instead, we decided to use the pertinent parts of the individual systems on a project-by-project basis.

In addition to performing the assessments, the consultant also interviewed customers to determine what they needed to feel confident in the quality of the Web. The results indicated that customers were seeking suppliers who are ISO 9000 compliant and working toward registration. With this input, the consultant worked with the firms to develop improvement plans based on the assessments. Together, they also established a minimum compliance level for the firms based on the ISO 9000 elements. See Appendix L. It should be noted that through this process it became apparent that SMEs can only absorb so many improvement activities at once. For example, if a firm has decided that ISO 9000 is going to be their current thrust, they may be very hesitant to also want to undertake team or EDI training.

Marketing Concerns: Gaining More Understanding of our Appropriate Customers

The Marketing Team was the third team that grew out of the original business plan presentation. They tackled the question of defining the Agile Web and what it was trying to sell. The team's description compared the Agile Web to an "all-star team" of competencies who brought the added value of having worked together and having worked out a series of integration issues that would allow them to respond rapidly and with greater value. Stating, "We provide an integrated and centrally managed solution to the customer's problem," the team was beginning to see the potential value of offering supply-chain management as a key selling point.

Following the recommendations of the marketing study, the group suggested focusing on new-product development in a series of industries with which the member firms had some experience. There was also a possibility to address Department-of-Defense (DoD) needs in the

area of rapid response to low-volume critical needs, including the upgrading of older product designs.

Marketing activities would be targeted to senior management, R&D specialists, and CEOs of small and mid-cap companies. The concept of the Agile Web and its services required more one-on-one selling and represented a significant enough change to make many purchasing groups reluctant to risk working with AWI. DoD access would also require a closer working relationship than the electronic commerce and bidding competition typical of that market. Two potential Defense possibilities included: special projects with specific agencies, and opportunities through Defense prime-contractors.

The Marketing Team recommended that a standard set of marketing media be designed to sell the Agile Web concept. They envisioned that these would be used by AWI itself, as well as by the individual companies. Many of the members had expressed confusion over how their internal salespeople and/or manufacturing representatives could market the Web consistently. Some also demonstrated a strong reluctance to weaken their own individual-company efforts by directing their people to market the Web. They continued, however, to be active and contributing participants in AWI. Interestingly, the salespeople who participated on this team saw the value of promoting and selling a Web as an extension of their company's own internal capabilities.

Early in 1995, one of the Agile Web companies announced that it was bringing its biggest customer to the Web. SurTech Industries, a job shop furnishing painting and finishing services, opted to avail its customer of the wider range of services that the Web could provide. This was a significant barrier to overcome--"the ultimate expression of trust," as one member described it. The company President decided it was time to take action to move the Web forward even if it involved some risk, and he showed great leadership in his actions. Most importantly for the pilot, it slowly opened the door for other Web members to step forward with projects of their own.

Unfortunately, that specific opportunity never came to fruition. However, as with past bidding opportunities, this customer effort helped better define the projects on which Agile Web should focus. For instance, this particular customer had a fairly rigid procedure for procurement. While the new approach of the Agile Web did interest a number of senior-

management people, the details were left to purchasing personnel still beholden to old procedures. For example, the resource team made several suggestions as to how the manufacturing process could be improved. The customer commented that the ideas were good, but noted that if they incorporated those changes into the drawing, current procurement procedures would require them to re-bid the package with the Web's ideas, not only to the Web, but to their other suppliers as well. Obviously, the Web would be reluctant to present similar ideas to such a customer in the future without the benefit of a signed contract. In other instances, the customer acknowledged that the Web's proposal was better than their in-house cost, but indicated they were restricted by the terms of their labor contract from out-sourcing without the approval of the bargaining unit. After a number of these occurrences, it became apparent that this customer was not an ideal fit with Agile Web's unique services. We learned the lesson that for customers to gain the benefits of working with agile suppliers, they must change their mindset as well. Agile Web cannot provide a great deal of added value in projects where effective partnering with the customer is not possible.

During this time frame, the Agile Web members themselves wrestled with exactly what it was they were trying to sell, and how they might effectively explain the benefits of the Web to their potential customers. They recognized that the benefits were not immediately obvious, and required a personal selling approach to more visionary, senior management. In addition, the past experiences of most of the firms in their own businesses had been for the customer to talk about partnering but end up selecting suppliers mostly on price. To open the door to potential customers, the Agile Web contracted with a marketing communications firm (Lieberman-Appalucci) and a public-relations firm (Shaeffer & Associates) to develop and deploy a plan.

A brochure was developed to better describe what the Web brings to the customer and to standardize the message in a way that better allowed each of the individual companies to present the Web to its customers. We determined that with a new approach such as the Agile Web, it was important to get the word out to a large audience to see who responds. Thus, press releases and background information were prepared and distributed to a variety of general business and trade media. This resulted in a significant amount of exposure to both potential customers and those interested in forming similar enterprises. See Appendix M.

The Marketing Team continued to work with the advertising and public-relations firms to develop a press release, background materials, a logo and tag-line, and a Web brochure. We expended considerable effort to ensure that the brochure contained the exact message of what the Web is, how it operates, and how it could help potential customers. We then developed brochure inserts in the form of individual, one-page company profile sheets, for the AWI president or a Web member to use in order to provide details on AWI's core competencies. We presented the brochures to customers and to the employees and salespeople of the participating Web companies to help them become more familiar with the competencies of the Web. It became apparent that selling the value-added services of an Agile Web was much more difficult than selling machine-time or brokering services. The benefits of dealing with the integrated and customer-focused Agile Web have to be explained to the potential customer and differentiated from competition that, on the surface, often looks similar to the Web.

One issue that arose in the marketing committee was never really resolved. The issue is whether the Agile Web should focus on selling to a *specific industry* such as, for example, the computer industry, or across a *range of industries* but within a particular niche, such as new-product development. To date, our marketing thrust has targeted the latter.

The Agile Web Marketing Team also started to consider how the individual companies' marketing approaches could be enhanced by offering the expanded capabilities of the full Web to their customers. Several companies requested that we at the BFTC put together a sales-force training session. We designed the session to help the participants present the Web and its benefits to customers, and to be prepared to respond to people who might feel threatened by the extra services provided by the Web. In one instance, an engineering purchasing manager of a prospective customer company attended a presentation on the Web, and afterward approached the speaker to say that the Web was going to put people like him out of work. We quickly pointed out that such was not the case, and that when the Web takes over managing the interactions between multiple suppliers, purchasing managers will have time to do the more strategic tasks management always wants, but never affords time to do. Thinking about this, he quickly came to realize the benefit to him personally in dealing with the Web. Subsequently, he even became an advocate of AWI, and his company eventually became a customer of the Web.

We also noticed that presentations on new business practices and agility need to be tailored to the audience. The direct applicability of some concepts varies at different points in the supply chain. For example, an agile company needs to “know its customer as an individual” and to understand how to fragment the market to increase sales in ways similar to those that have recently occurred with sneakers in the footwear industry. For firms that sell products to the consumer market, or that sell into high-volume industrial markets, these concepts are applicable, and firms should apply these concepts to gain market share. But, in the supply-chain/job-shop environment, these types of examples are less meaningful. Job shops have survived by focusing on specific customers (other companies as opposed to consumers) and tailoring their services to exactly what that customer is requesting. They already know their customers, and view them as individuals. Thus, job shops need to work with their known customers to see how they can provide more services or quicker response.

At a meeting during the Spring of 1995, the full Web membership accepted the recommendations of the teams with the only major change being the modification of the dispute-resolution process, as noted above. We found that *once the Web members themselves began to step forward and lead the efforts, progress came much more quickly and easily.* They were more likely to respond positively when led by one of “their own.” More importantly, business owners are the type of people more engaged by dealing with specific issues and problems instead of broad conceptual discussions. Once they agreed on the dispute-resolution process, the incorporation work was then passed on to the attorneys for documentation.

Trust on the Up-Swing

By early 1995, the degree of trust among the Web members had grown. In addition to the collaborative conversations that took place surrounding the October simulation and business plan, 16 projects had been brought to the Web in one fashion or another during 1994. These allowed each of the companies to gauge the others in terms of their reliability and commitment to the Web, at least as far as their efforts prior to award of a contract. While some of the company representatives were often reluctant to commit time to conceptual discussions of agility, they were aware of which companies attended meetings regularly and made a

contribution on the Web customer bids, as opposed to those who were less than reliable in their attendance. Furthermore, those companies whose CEOs or chief decision makers showed up were judged more highly by their peers than those who sent subordinates who were often unable to make instant commitments on behalf of their management. Very slowly, Web members were also beginning to consider each other as sub-contractors for their own business outside of the Agile Web.

The Evolving Constellation of Members

Early in 1995, the membership of the Agile Web underwent some changes. One of the original Web members dropped out of the project. Instead of entering new markets with the Web, this firm decided to build a vertically integrated company of its own to provide services it considered competitive with the Agile Web. Two other companies, which had been largely inactive from the beginning, finally dropped out by the beginning of 1995.

At this time, we recruited three new companies. A regional industrial-design business joined after they had been contacted as part of our marketing survey. We saw a good fit between their design business and the Web's present array of manufacturing capabilities. We also added a defense supplier to provide greater capabilities in that area, and recruited a printed-circuit-board assembler to replace capabilities of the three departing members. And, to broaden our services in the new-product-design market, we also brought in a rapid-prototyping company. To our delight, the new companies were integrated remarkably well into the group. Largely this resulted from their coming on board just as the Web began its most interactive phase: namely, responding to the challenge of the business plan and the move toward incorporation.

Sharing Information: Peer Inspiring Peer

Once the Web members began to understand the competencies of their fellow Web-member firms, some of them started to use AWI as a marketing tool for their own current customer base. This took a giant leap of faith on the part of the leadership of each individual Web-member company. At first we tried to get all Web members to buy into everything the same way and to the same level. We continued to try to expand everyone's vision, but committees

such as the Marketing Team, made up of a subset of the total Web members, proved to be a much more effective way of getting “buy-in.” Once these subgroups bought in, they, in turn, sold the concept to the total group, peer-to-peer, and most of the Web rapidly accepted the teams’ ideas.

In the course of various committee work, it also became apparent that members had joined the Web for different reasons. Firms with a strong desire to be “better” in the future seemed to be more committed. On the other hand, those who joined solely for new business appeared less committed to the Agile Web concepts and less willing to do anything but participate in a traditional supplier role.

As we gained more experience working together in our different groups, the sharing of information between Web members began to increase. Members began to exchange information on pricing and costs of doing business in ways that they never would have considered only a few months earlier. An increase in inter-company communications and relationships drove this development. Furthermore, the sharing occurred as a natural part of the process of teaming to develop the best solution for the customer. Thus, members could see the need for sharing versus having a conceptual discussion regarding pricing. Many Web members began to use each other as subcontractors on their own jobs. One member company, skilled in painting, came to the aid of another member whose primary product was sheet metal enclosures but whose paint-line process had gone out of spec. The painting company helped them get their process back within the required tolerances even though the painting company could have done the work themselves as a subcontractor, and received the increased revenue.

Agile Web, Inc.: Formally Incorporated

On June 12, 1995, the Agile Web was officially incorporated at a full meeting of the Web. A Board of Directors was chosen, consisting of four Web company representatives and BFTC’s Executive Director, Dr. Mark Lang. A member of the BFTC staff continued in the role of Acting President until a permanent one could be hired. As we reached the middle of 1995, our attention turned from the legal incorporation to the challenge of procuring actual business that would drive the development of new business practices.

The Board of Directors assumed its management duties and proceeded with setting up the business of AWI. The Directors named a chairman, hired an accounting firm, approved an operating budget, and investigated and purchased Directors and Officers insurance for AWI. In addition to focusing on systems improvements, the board also took steps to hire a permanent Web President. Advertisements for the position resulted in over 200 responses.

After the official incorporation of AWI, a number of key organizational developments occurred. First, it became apparent that the Web project was forging new and exciting developments in organizational approaches and business practices and that these were the key to the Web's success. Thus, the BFTC arranged for a consultant hired by the Agility Forum for the project, to capture and document these through a series of case studies. This decision to develop a series of relevant case studies would prove to be very valuable as time went on, since developments began to occur in many parts of the project. The studies provided a resource for Web participants to take stock of accomplishments to date, and to recognize areas in need of further attention. They appear as Appendices at the end of this report.

By September of 1995, we had received approval for a 12 month, no-cost extension of the Agile Web Pilot Project. Even with this extension, we began to focus our efforts in three areas to accelerate results:

- Formation of Agile Web, Inc. and defining its operation & marketing
- Reinforce and enhance efforts to change culture to collaborate
- Get an information system in place to support work as it developed

Targeting Systems Improvements: Our Early Experiences

The BFTC staff had always felt that relationship issues would be the key to success. However, we recognized the need for support systems as business came into the Web. To address communication issues in mid-1994, we began to explore the use of electronic commerce, electronic data interchange (EDI), and e-mail. We expected the companies to embrace this new way of handling business communications and transactions. Given the difficulty experienced by others in integrating even simple systems from different vendors, we decided to purchase common computer hardware and software to provide the members with EDI and e-

mail capabilities. Training sessions were scheduled for the participants, and were conducted by the Electronic Commerce Resource Center (ECRC) at the University of Scranton.

To help get the group started with these tools, we organized two training sessions at the BFTC, and began using e-mail to communicate with the members. Even after the training was conducted, however, usage among the members was spotty. The new business practice of "communicating electronically" had not been embraced as quickly as we had expected. Instead, the companies resorted to traditional paper, fax, and phone methods. We at the BFTC saw benefits for the Agile Web; however, the members did not actively embrace the technology. An evaluation showed that each company and CEO had favored systems and ways of doing business, and at this point, it would take very compelling reasons to change. At this point, there were not enough real business reasons and projects for the Web to really use the technology.

In our experience, we found that moving to the use of PCs and Value Added Networks, (VANs) on a daily basis was not an easy change for some companies. While some had been "forced" to use the technology because of customer demands, many had little experience. This difference in proficiency had an effect on the Web. Because everyone did not use the communication tools regularly and effectively, some members began to lose confidence in the new technologies. Some of the firms did not check e-mail on a regular basis. Others checked e-mail, but did not respond to other members or the BFTC staff in a timely manner. Consequently, firms fell back to using the phone and the fax machine. The BFTC staff did likewise to ensure that everyone received our messages.

In an ongoing effort to increase usage, we provided customized training in e-mail and the EDI package for the Web members. A little more than half the Web companies took advantage of the training and a subsequent test-collaboration scenario that followed. Both technical problems and lack of priority caused the round of transactions that constituted our scenario to be completed several months later than we planned. A few of the members had individual customers pressuring them to use EDI, however, and these companies displayed more interest in the training.

One difficulty in using EDI with the Web arose because most of the members are basically job shops. As such, they do not produce a product of their own, but sell a service to their

OEM customers. EDI, to date, has most generally been used to streamline the ordering of commodities and repetitive parts, rather than enhancing the delivery of services or design work. Thus the Web members did not see the value of EDI in terms of expanding their business, but rather as something they were forced to do to retain their current customers.

In an effort to find ways of electronically posting services the Web might provide and monitoring requests for services the Web might fulfill, the BFTC contracted with Datamatix, Inc., located in Plymouth Meeting, Pennsylvania. Datamatix, a VAN company, had been providing our e-mail and EDI capabilities, and were now brought on board to experiment with innovative ways to publicize the Web's services electronically and seek out potential clients. Datamatix developed a World-Wide web-site to post the Web's services and match them with electronic requests for proposals, but members did not express much interest, particularly because relatively few postings seemed relevant to the Web's business possibilities.

Information Technology: Getting beyond the Telephone

Initially, we reviewed the current use of technology at all the Web member sites, and developed a level of understanding of what they were currently using. We knew that the high level of communications required to support Web collaboration would benefit greatly from stronger communications technology. Furthermore, the consultant who performed the business reviews, J. Mitchell and Associates, had recommended the Web install a system to allow for easy access to order-entry, project history and status, invoicing and payments, and other business processes that would be used by multiple Web members working on Web projects. This data system should also be accessible by AWI itself. See Appendix N.

The information system was defined to allow for the ability to access and update a common database for customer contacts, project management, enhanced e-mail service, Internet access, video-conferencing, interactive white-boarding, and shared applications. As we moved to implement these features we discussed a number of technical integration issues and, more importantly, people interface issues. We found that integration of external e-mail with any internal LAN at each company is critical for its use. If the Web companies have to do something extra to check external e-mail from other Web members, they will not likely use it consistently. The technology must be right at the person's desk and easy to use, but it must

also be integrated fully with systems they normally use each day. Datamatix, and Lehigh University's Enterprise System Center were contracted to help implement this Web system. Each Web member was individually connected to use some portions of the system that suited his needs.

Several of the companies began working with Datamatix to receive government RFQs profiled against their own capabilities. During this time, contact had continued with the DoD and DLA so that the Web could become part of the bidding process and a trading partner with the DLA. The lessons learned from these experiences, however, reinforced the fact that it is difficult for most customers, including the DoD procurement agencies, to understand how the Agile Web could speed delivery or provide greater value. Also, questions regarding drawing changes and product enhancements for "manufacturability" could not be easily answered because current procurement procedures prohibit providing additional information to any bidding supplier. In fact, for our experiences at least, the DoD system isolated the real end customer who can decide on the merits of changes and improvements from the supplier through a formal procurement system, which takes away most of the value of Agile Web. While helping to insure fairness and competition, this lack of direct personal relationships presents a barrier for the DoD to obtain cost benefits of customer-supplier partnering occurring in the public sector.

Bidding Opportunities: Working in the Real World

New business and new customers both from the commercial business community and the DoD and the Defense Logistics Agency (DLA) continued to be a primary focus for the BFTC staff. Several of the opportunities from 1994 remained active well into 1995, but few resulted in the actual awarding of a contract to AWI. As we moved into the second half of 1995, the number of customer contacts increased significantly due to the publicity we had generated. The publication of articles about AWI in trade journals and interviews by the news media generated considerable inquiries for information about the Web.

Defense Projects: Some Success

Our capabilities were known by portions of the DoD, and we were called out as a possible source of parts on an RFQ by the Tobyhanna Army Depot, one of the original pilot team participants. This resulted in the awarding of our first production project to be performed for a supplier to Tobyhanna. Although the full value of the Web was not brought to bear on this project, and it involved only a single member of the Web, we won the order because of our rapid response and manufacturing process ideas. The Web member made the parts, and hand-delivered them directly to the end user, the Tobyhanna Army Depot.

A more complete measure of Agile Web's added value to the DoD was demonstrated by the completion of a design project that we initiated in 1994. Tobyhanna had brought a problem to the Web related to a turn signal that was failing in the field and was no longer available from the OEM. After reviewing the situation, the Web Resource Team determined a design weakness and proposed a redesign offer that was acceptable to the DLA. This new design was well received at a formal review, and was jointly recommended as a DoD quality improvement project by the reviewing people from Tobyhanna and the DLA. However, the product never proceeded into production because another part of the DLA had previously contracted out a new design for the same assembly, and those parts were already in production. Apparently, the DLA system is so large that it was difficult for the people we were working with to know what was happening in other parts of the organization. In several cases, information on root causes of defects and design criteria was difficult to obtain as well.

In working with another portion of the DoD, the Web spent a lot of resources proposing improvements and preparing a bid to improve the designs of new-development products for the DCSC. These parts were not yet ready to be put out for RFQs, and we failed to realize they were only looking for budgetary numbers. Later, we found out that the products had been handed off to the actual procurement group, who released the RFQ for production without notifying the Web. This experience pointed out the pitfalls and complexity of working with at least some aspects of the DoD. It showed us that the DoD supplier must be very aware of the system before jumping in, which discouraged the non-DoD-savvy members of the Web from considering further DoD business.

Commercial Business: Some Encouraging Signs

We continued to seek projects from commercial firms and by the end of 1996 had worked on over 60 potential projects. In one instance, a manufacturer of window hardware for the construction and replacement markets contacted the Web to bid on several parts of a new subassembly. The subassembly was in development for a new product and a new market they wished to enter. Upon ascertaining that the customer had not settled on a final design for this product, the Web formed a Resource Team to travel to the customer's site. We gained an understanding of the customer's goals and needs, and, as a team, developed some great suggestions on how to economically manufacture this rather complex product. After just a few meetings with the Web resource team, the customer informed us that working with the Web, and having all parties in the same meeting room, had taken months off his normal development-cycle.

All was not a bed of roses, however, when dealing with Web projects and customer interfacing. In one case, one of the member's poor internal communications caused the Web to look bad in front of a customer. In this instance, different people from the same Web company took different positions on a topic when negotiating with a customer, and unknowingly bid against each other on the same project. This reinforced the need for more internal communications inside and between the Web companies. In another situation, two Web members working together on the same project had a series of miscommunications. As a result, one member did not meet his commitment, at least in the eyes of the other member. It took a long time to repair the damage, and to restore the trust between the two.

As relationships among the members grew, and they developed more and more trust and confidence in each other, they began discussing other business possibilities, such as producing their own "Web Product." The BFTC staff had been approached by a few entrepreneurs with ideas for a new product. They were seeking someone either to purchase their product or the rights to their design. These potential projects were presented to the Web members and, in one instance, resulted in an ongoing relationship with the entrepreneur. Unfortunately, however, it never led to an actual Web Product for two reasons. First, the entrepreneurs did not have funding for development, and such would be difficult to obtain elsewhere. Second, neither the entrepreneurs who approached us nor the Web had the experience and resources to market a

new product. We determined that the best role for Agile Web would be to do the design and manufacturing for a company with an established marketing capability.

On other non-Web projects, however, Web members began to increase dramatically the amount of business they did with each other on a one-to-one basis not formally involving the Web. Numerous examples were brought forth demonstrating how the members were beginning to realize what competencies other Web members could provide. Rather than going elsewhere, companies were now staying in the Web. In several cases, they felt comfortable asking other Web members for special services, such as doing a job over the weekend to make up for a malfunctioning machine at another member's plant. BFTC staff were pleased to see this activity, but we realized it still did not represent the new collaboration we were seeking.

As the Web members encountered more and more potential projects, we continued to focus on the internal deployment of agility and the procedures for operating an Agile Web. Several participants had been proactive in introducing their employees and workforce to the concepts of the Agile Web; others preferred to wait for an actual customer project before involving more than a few employees in the Agile Web's activities. Evidence of increased interest among the group did, however, begin to surface. We began to see an increase in the number of Web members who were bringing projects to the Web for bids. We also found that having Web members offer greater services to their current customers is an excellent way to get more business. This is possible once the trust and confidence is established among the firms. As an encouraging sign, several members began referring work to the Web even though their own firm would have no role in the project.

It was about this time that we recognized that job-shop style companies need to think "out-of-the-box" in order to see potential business that the Web might provide for their customers. Being in close and constant contact with customers provides insight into their needs, which the job-shop, as an individual company, would not have previously considered. A web member proficient in sheet metal fabrication should look at his customer's total needs, which might include electronics and painting for the complete product or subassembly. He must then take the initiative to suggest to the customer that the Web can handle the total project, or even bring in the Web to make specific suggestions. Through our work, it became clear that changing this paradigm in approaching the needs of the customer takes a considerable effort.

Infusing Agility throughout the Web: Including Company Workforces in the Agile Web

Initially, the Web member CEOs did not effectively share their understanding of the Web and its objectives with all employees in their organizations. As a result, most of their sales forces were not selling “Web” capabilities because they did not understand the Web and what it meant to their firms. After participating on the various teams, however, the CEOs of the member companies began to realize that, to be successful in the Web, they had to have the support of their employees. They knew that the Web would demand different tasks and new decision-making skills from their workers. Consequently, the need for a greater understanding of the Agile Web by employees throughout the organizations of the participating companies became more and more apparent. Early in the project there were rarely more than one or two company representatives involved with, or even aware of, the Web. With an increase in the number of quotes generated by Resource Teams, an upsurge in the willingness of Web companies to bring their own projects to the Agile Web, and a high level of participation in improvement projects, we began to see greater involvement by employees--not just CEOs--within the Web firms. For instance, sales and purchasing people participated in the VOA simulation. Management Information Systems and clerical personnel often led company efforts in EDI training and testing. Quality control managers were the chief contact regarding the quality assessments. As such, the concept of the Web was beginning to work its way into the individual companies.

Because we had a great interest in the subject of cultural migration and human resource issues, we hosted a Web-wide seminar by Rick Seaman, then the Director of Strategic Planning at Solectron Corporation in California. He discussed the importance of aligning strategic planning with customer needs as well as with the entire organization. He shared how Solectron had transformed its workforce and had implemented self-directed teams. Following this presentation, we formed a training committee to research the training needs of Web companies seeking to develop agile workforces.

Agility's “People” Component

As one can see from the story this far, it was becoming very clear that new working relationships among the Web participants--a whole new way of thinking about business--was the key to unlocking the value of the Agile Web. We had also seen how difficult it was for

people to change, particularly in the absence of a crisis that would make them more open to taking necessary risks. Several of the Web companies recognized this and asked BFTC to develop training to assist them in changing the culture within their firms and strengthening the ability of their workforces to collaborate. The BFTC team also saw a need for help in promoting changes that we were just beginning to understand. As a result, we issued an open-ended request for assistance to a number of experienced training organizations.

A number of proposals were received, and the best were reviewed in detail. These programs, while useful for their intended purpose, did not get to the heart of the intensive collaboration we already knew was needed for the success of the Agile Web. After close scrutiny, only one got beyond the traditional team-building/problem solving methods and addressed our needs fully. A proposal by The Davison Group (TDG), however, displayed a good deal of innovation in addressing the degree of culture change we needed. The Davison Group had significant knowledge and experience in uniting different people and groups around a common mission, taking into account differences in personality and style that can interfere even when the parties want change. They also proposed a very innovative way to use a multimedia approach to capture the change process and make it easier in the future. The Davison proposal involved significant effort and pushed the technology, but was clearly on target. Because the cultural change was the key driver, and because we felt our pilot effort would help others by evaluating the process and new tool, the BFTC staff opted to accept the Davison proposal. The addition of TDG, along with the hiring of Bill Adams as Agile Web President, really accelerated our progress.

As we began 1996 with the addition of TDG and Bill Adams, it became clear that we were entering a pivotal year for the Agile Web. We had already moved from experimentation in 1994 to the creation of a formal corporation in 1995. In 1996, the Web was faced with the need to move toward "reality," that is, toward a real company able to sustain itself after the end of the pilot funding.

Cultural Transformation: A New Tool

We had seen that "traditional-thinking" customers had a hard time understanding the "new thinking" of the Agile Web. Similarly, it was difficult for companies within the Web to

collaborate when the rate of transformation to agility differed significantly between companies. For these reasons, we concluded that the key element in the success of an Agile Web, or other collaborative venture, is the building of trusting relationships not only among the company leaders but also within the individual workforce of each firm.

Realizing the importance of relationships, we worked with TDG on a three-pronged approach to enhancing those relationships. First, we supported the development of TDG's multi-media prototype. The prototype consists of a CD ROM based program which models the complex interactions and relationships between people in a simulated company. It is designed as a game in which the player follows and directs the characters through the daily routines of business, with opportunities to stop and explore the individual thinking and history behind each character's actions. Designed as a facilitating tool, it is meant to be used in a group, most likely with the assistance of a facilitator or mentor. Through recognition of behaviors and the ability to see activities from multiple points of view, the user will become more aware of similar behaviors in his or her real-life company.

The complete simulation game requires detailed modeling of many employees and interactions between them, as well as an elaborate structure and user interface built around a simulated physical environment. Our pilot could not commit the time and resources to complete the finished product, but it was felt a prototype could be produced to evaluate the concept. The prototype was not expected to be completed in time to be utilized by the Web members during the pilot, but the results that clearly showed the way would be important assistance for future web programs. To collect their material, TDG directly observed and facilitated Web activities. The Davison Group has committed to continue work on their own to commercialize a product based on what has been learned from the prototype.

Workforce Issues: Getting Agility into the Companies

A second phase of the cultural change effort required the deployment of this change to the participating companies. Individual pilot activities with two Web companies were initiated at their request to assist with their efforts to create an agile workplace within their organizations.

Back in 1994, we had contracted with the NIST/CAMP Great Lakes Manufacturing Technology Center to train BFTC staff and our partners at Northampton Community College

to conduct human-resources assessments. We felt that it was important to be able to perform this type of assessment, integrating elements of agility with the original tool. At that particular point in the project, however, obtaining business and getting the firms to work together represented higher priorities, so we did not actually pilot the human-resource assessment with a Web firm.

One of the pilots utilized this original work. It involved a series of facilitated meetings between management and the workforce to achieve the mutual understanding needed for a more collaborative work environment. Eventually, an employee survey was used to identify areas of opportunity. Although tempered by a healthy skepticism, by and large the response from both management and the workforce was positive. While our direct involvement ended with a final report to upper management, the company went on to form improvement teams and, last we heard, management had responded to several employee concerns.

In a second pilot project, the BFTC staff, with advice from TDG, led a Web company through a mission-development exercise that included a significant level of mentoring for the top management. The process, though far from finished,--if, indeed, such a process ever really finishes--has made progress. In one of the most encouraging signs, the company has begun the transition from a hierarchically controlled environment to a more empowered and collaborative one.

Some of the lessons learned in these projects focus on the difficulty of altering a company's culture, even when top management understands the need, at least in a conceptual sense. Similar to difficulties the Web companies had in recognizing when they acted contrary to their Web "principles," management often falls back into what is familiar but counterproductive to overall progress. Fear of losing control, even subconsciously, is a difficult personal barrier to overcome. Executives must demonstrate positive, visible change over the long haul before employees fully accept the change. Entrepreneurs who start their own firms and feel responsible to provide continuing employment to loyal workers are particularly vulnerable to doing things for their employees "for their own good." Unintentional reversion to old paternalistic or hierarchical behaviors (often based on customer or internal pressures) can lead to employee cynicism, but having an active mentor available to point out the inconsistencies can help combat slippage. It is often difficult for employees to attribute honest human error to

upper management when management engenders a paternalistic culture and tries to appear infallible. Reshaping this kind of culture into a more empowered work environment represented one of our central tasks. By the end of 1996, it was obvious that the company was truly working to transform itself by developing and implementing agile practices within its own organization.

Transition to Reality: Facing the Issues

Along with development of the multi-media tool and the individual company transformation pilots, the third and final phase of enhancing relationships involved Agile Web as a whole. It was clear that the web companies had to change as a group, as well as individually. The lack of Web projects over the past two years had prevented the participants from testing the bounds of collaborative behavior and allowed them to avoid difficult decisions and risks.

At the first meeting, held in February 1996, Bill Adams was introduced to the members, and the group focused on obtaining business. Despite reviewing projects and submitting proposals for numerous customers over the past two years, very few orders had been won. One of the main purposes of the meeting was to get a commitment from the Web members to market the Web to their customer base, while Bill would drum up work from new customers.

Many of the companies could not see a reasonable way to utilize their existing sales resources--in many cases independent agents or brokers--without creating confusion for their own customers or detracting from their individual company efforts. The two largely defense-related businesses were especially uncertain as to how they would sell the added value of the Web to the DoD or other government entities who retain an arm's-length relationship with suppliers.

The group was evenly split between those who saw opportunities to sell the Web capabilities to their client base and those who saw the Web as another sales arm for their organization--in essence, a broker. It became apparent that the differences inherent in the core business of each Web member would make it difficult for all of them to sell the Web to the same degree or in the same way. These broad differences in culture made it even more difficult to make any collective changes across the Web. It was difficult to generate a common vision for the Agile Web in the face of varying individual company visions. This problem was not

really new. It had shown itself in different ways all along. However, as the need for action grew, what we thought was a common understanding turned out to be people using the same words to mean very different things.

Uneasiness as to whether or not companies were obliged to provide direct sales support for AWI led to the departure of one of the original Web companies. Acknowledging that the Web request for such assistance was legitimate, the company's leaders, nevertheless, determined that their own best interests lay in another direction. They departed amicably, but this episode signaled that the Agile Web's journey from experiment to reality would eventually force all of the members to confront some difficult decisions, both as a group and as individual companies. This type of confrontation was anticipated and was actually healthy in developing a group that could work together.

Working with Customers: Client-Development Teams

Initially, Bill Adams proposed forming "client-development teams" as a way of developing long-term relationships with large companies. These were different than our prior Resource Teams in that they were designed to approach a customer and suggest ways Agile Web could help provide value *before* the customer made a specific request. In his view, such customers were looking for a way to create entrepreneurial activity within their own companies, and would be eager to work with the Agile Web in those areas. Bill's intuition proved to be true, but several incidents during the first half of the year pointed out the difficulty of implementing that approach.

During the Spring, for example, Bill Adams recruited a team to discuss a project with a manufacturer of large industrial equipment. During the visit to the customer's facility, Web members fell into their familiar pattern of sorting through the requirements in search of parts that fit their individual companies' capabilities. Rather than addressing the project as the single seamless company touted in their marketing material, the Web members instead operated as a collection of brokered companies, each with his own agenda. In another instance, one Web member misrepresented the capabilities of another absent member, claiming that the company in question was incapable of performing certain work.

Yet at other times, both individuals and resource teams did an outstanding job of representing the Web as something beyond their own individual companies. In discussions with an instrument manufacturer, there was an impressive interplay among the client development team members, as they explained how they could work together to solve the customer's problem. In another meeting, this time with a major defense contractor, Bill brought a single-company representative to discuss a job that required only a single Web member to satisfy. But, in the course of the meeting and plant tour, the Web member proactively pointed out additional instances where the Agile Web could be of assistance to the customer, even though this additional business would have gone to other companies within the Web.

It should be pointed out at this juncture that most, if not all, of the non-collaborative behavior was inadvertent on the part of those involved. They, in fact, were simply acting as they had for years in representing their own home company. When representing the Agile Web, however, a different mindset would be required. They would need to be collaborative in their approach if they expected the customer to believe in the benefits of AWI. This became especially important as a major meeting approached with the centralized procurement function of a large potential customer. Accordingly, we held several meetings to coach and prepare the company representatives to act in a manner consistent with the Agile Web's message. This exercise proved valuable, as the Web impressed the customer by building off each other with suggestions for the customer. This large defense company was obviously surprised at the way small company entrepreneurs approach issues of cost and delivery in creative ways.

The strengthening of trust among the members continued to grow in many instances through individual side deals that had been occurring among the members outside of the Web structure. We began to see several cases of one company calling another to bail them out of problems arising from machine break-downs or other emergencies. Growth in trust was not without occasional pain, however. Relationships became strained at times, especially when fellow Web members failed to perform as expected, be it in terms of delivery or pricing. We concluded these problems resulted more from differences in business style (what each considered as the correct way to operate) than from intentional non-performance. Once again we saw the importance of communicating a common understanding before the issues are

tested. While any such missteps along the way can reverse the progress toward true collaboration, for the most part the collaborative experiences had a positive effect.

Bill had worked on aspects of agility at his previous position with Lockheed-Martin, primarily with respect to creating micro-businesses that network together within a large firm. Based on Bill's experience, we began to better understand a weakness in our prior marketing activity. When we presented the concept of a responsive, collaborative web to upper management and the engineering staff of a potential customer, they expressed interest. Once the project was assigned to procurement personnel, however, they tried to manage the individual Web firms in their traditional way.

In our zeal to get business that would allow us to test Web collaboration, we had often been pushed into responding to an RFQ laid out in direct competition with the customer's existing suppliers--an area where the strength of the Web provided little additional value. Bill Adams suggested a different approach to the customer. He felt strongly that we should propose a Web- oriented solution and walk away if the customer only wanted a commodity supplier. His experience with large companies, leading to a focus on targeting relationships with a few good prospective customers, was an important turning point.

Defense Procurement Issues: Discouraging Experiences but Possibilities Remain

In the defense arena, we had also reached some conclusions regarding our preferred niche. On the defense side, we had put considerable energy and time into working with the DLA and other agencies to find a way of using Agile Web's value-added services to solve military procurement problems. There was some thought that Agile Web could become a supplier of short-run, critical parts that were no longer commercially available from the OEM. For example, Agile Web might be able to suggest more up-to-date materials or processes. We offered to test this possibility with a number of agencies, but these efforts were stymied by other priorities and budget considerations within DoD. The only project on which these capabilities are currently being used came via Penn State's advanced-research labs through one of its projects with the DLA.

Agile Web was at a disadvantage in trying to address DoD needs because of our lack of prior defense industry experience. While many of our experiences were frustrating, our lack of

knowledge and the relatively limited exposure we had to DoD as a whole prevents us from drawing broad conclusions. Through those limited interactions, however, we have come to conclude that except in cases where procurement procedures allow more long-term collaborative relationships, there is little that Agile Web can provide beyond what other individual suppliers can do. While we did win a few orders from Tobyhanna during the three-year project, most of our efforts involving defense procurement proved unsuccessful.

Yet all is not lost in terms of Agile Web's applicability to the military. We believe the Agile Web could provide a great deal of value by working with large defense prime contractors. Furthermore, the defense primes have a greater opportunity to establish long-term relationships with the DoD that includes interactions with the specific military customers of a given product or system. Agile Web can enhance those relationships through a long-term collaboration with the prime. The Web is having ongoing conversations with a number of primes who are interested in teaming as a way of applying their considerable amount of defense-related technology to the commercial world. Agile Web may not only be a supplier to the primes, but might possibly be a partner to collaborate on third-party projects. For our particular mix of companies, this seems the most likely dual-use application. It should be noted that there are only two companies within the Web that currently do a significant portion of their business with DoD. Another web, composed of experienced defense suppliers, might well find other avenues to dual use, but the need for more collaborative procurement procedures holds even in that case.

On the commercial side, by the end of our third year we had defined which opportunities were truly applicable to the Agile Web. Our targets were:

- Situations where the web could flexibly integrate multiple competencies and problem-solving approaches and industry experience to add value and reduce cycle times for the design, prototype, and production of new products.
- Situations where a larger firm has rationalized its procurement activities and needs a broadly capable and flexible supplier with whom to partner.

Those customers whose needs could be met by a single company would not be pursued by the Web, but referred to the appropriate company within the Web.

The Virtual Organization Agreement: Developing Operating Principles

As the president worked to build long-term relationships with a number of large customers, the idea of a Virtual Organization Agreement (VOA) came off the back-burner for renewed attention. One barrier to obtaining business as an unproven, asset-less, virtual firm, was the customer's fear of dealing with only a phantom should something go wrong. With no assets to lose should it become embroiled in a suit, the Web would have to protect customers' interests by passing liability through to the subcontractors who did the actual work: namely, the Web members involved in the project. Customers wanted to be assured that this obligation was legally documented before they risked contracting with Agile Web. The planned VOA would provide that documentation by defining the legal relationship between the Agile Web, Inc. and its participating suppliers.

At the February meeting which focused on Marketing and Sales, our legal advisor also distributed a draft VOA for review and comment by each of the companies. He told those present that the draft intentionally addressed many issues that would arise only in special circumstances or when problems developed. The idea was to get these situations in front of the group for discussion on whether, and how, to include them in the final document. The Web's attorney asked the members to review the document and get back to him with questions and concerns before the next full-Web meeting, to be held in April. Only a few concerns and questions were raised ahead of time, leading the BFTC staff to believe that we could gain rather quick approval for the document. Having made only some minor changes to the VOA, we devoted a good bit of that April meeting to other issues, such as reports on marketing efforts and a customer presentation, before opening the discussion on the VOA. To our surprise, slowly, but with growing momentum, a trickle of objections became a flood of criticism. Most objections concerned the inclusion of fairly stiff consequences in the event of failed performance by a Web member. While counsel pointed out that they were already subject to most of the consequences under standard commercial law, having them spelled out in the agreement seemed to force the would-be collaborators into a defensive mode. While

most of the recourses for non-performance would not come into play if the final customer-contract provided better terms, the members still felt exposed to risks they would not have agreed to in individual contracts. This exercise also opened their eyes to their vulnerabilities within existing contract law. Many members indicated that they later reviewed other customer agreements they routinely signed and accepted and found provisions they never understood.

As a result of the fall-out over the VOA, some began to question the need for a legally binding document. Their attitude seemed to be: "Based on our ethics statement, we'll work together to work it out somehow, should a problem arise." This attitude is understandable because these are small, privately held firms which pride themselves on always making it right for the customer regardless of the legal terms. It became obvious as the discussion continued that we needed to take a different approach to the VOA itself. While it was likely that eliminating or modifying a half-dozen offending clauses might well have produced an agreement on the document, an edited contract would not have forced the members to confront their underlying concerns. And we needed to confront these concerns. The basic issues were: How would the Web members agree to work together on a project? What were the rules or guidelines under which they would operate? Falling back to the "we'll work it out" mentality, while agile on its face, seemed only to be setting up the Web for future internal squabbles.

With the meeting's discussion at an impasse, the participants decided to create a subcommittee of the group to modify the draft VOA, taking into account the objections that had been expressed. Through subsequent discussions between the BFTC staff and TDG, we decided to move away from conceptual discussions and create realistic situations that might stimulate discussions of each issue. We prepared a series of questions to explore and resolve on a broad range of business issues that would likely confront the Web in the future. Out of this process, we hoped that the members would develop a series of "Operating Principles," more detailed than the Ethics Statement but without the legalistic overtones of a contract.

We held a series of meetings with the subcommittee to discuss and reach consensus on these questions. Two methods were employed during these meetings which significantly improved the process itself, and should be considered by those seeking to replicate the Agile Web. As the individual questions were discussed (the use of questions was a productive

method in and of itself), Bill Adams and Ted Nickel--the former acting Web President--illustrated many of the generic statements with recollections of actual behavior they had observed of Web members. The subcommittee members were surprised to learn that many of these "bad" behaviors were actually happening. We pointed out that all the examples were failures to "think as a whole," not conscious attempts to undermine the Web--illustrating the difficulty of changing to a fully collaborative culture. As a result, the subcommittee members were more cognizant of the need for specific guidelines, and were also able to get into "meatier" discussions of the questions presented to them.

A second useful innovation were the nearly verbatim transcripts prepared by Dr. Greg Kunkle, the consultant who was gathering material for the series of case studies published in the course of the project. These detailed notes allowed members who were not present at the meetings to understand the evolution of the group's thinking. We distributed these notes to the larger group after each meeting to prepare them for the presentation of the Operating Principles at an upcoming full-Web meeting.

After nearly three months of work, the Operating Principles were presented and adopted with only minor wording changes at an August meeting of the full Agile Web. A personal commitment to the principles was obtained from each of the members. See Appendix O.

Although the Operating Principles were developed and adopted by the AWI member companies, the actual ability to use these new ways of doing business remained a difficult behavior for some of the Web members to embrace. Several Web companies were observed violating provisions of the Operating Principles within days of their adoption--but not realizing they were doing so because it was business as usual.

For example, some AWI members would continue to talk to customers about their own companies with their own chains of suppliers instead of promoting the Web. We also had an example of Web-member employees meeting with customers and deriding the customer's goals or the technical possibilities of ever achieving those goals. Consequently, the customers questioned whether some of the Web members were totally committed to meeting their needs. Bill Adams had to individually counsel these Web members off-line to ensure this type of activity was not repeated. This counseling proved to be effective and the offending Web member employees began to change their message when working with other Web members

and with the customer. At the least, the Operating Principles provide a documented guideline to help educate the participants.

It must be pointed out, however, that there were many more examples of great teamwork and collaborative behavior among Web members, who truly presented the Web as a seamless entity to the customer. Members have been observed recommending another member's process, even in the same industry, when it would clearly provide a better solution to the customer. One of our DoD suppliers agreed to manage a customer's defense effort in adherence to all specifications, even though none of the actual manufacturing work would be done by that firm. Knowledge of standard industry practices and even the use of a skilled engineer were provided by companies who had no assurance of follow-on production work.

With what we learned about how Web-member employees react in front of the customer, we would recommend that other similar organizations provide training sessions for these employees prior to gathering in front of the customer. If this does not prove effective for some of the members, they might need to be asked directly if they intend to change their behavior or would they rather not continue to work together. To be effective it must be one way or the other; members cannot view and present themselves as individuals and still be part of the overall solution team for a customer. Bill Adams continued to work hard at having the members develop their ability to work together as a team.

Quality: Developing a Web-Wide Approach

While the development of the Operating Principles and ongoing marketing efforts constituted the major focus of the project during mid 1996, several other activities were also in progress. Work on the Quality System and the communications technology continued, as did the overall process of change itself.

With the company assessments completed, we then turned to the task of developing a Quality system for AWI itself. While many of the elements of an ISO 9001 system would fall solely on the individual companies involved in a customer project, a structure for how customer quality requirements would be monitored and passed to the virtual organization had to be documented. Web-level policies and procedures for such activities as contract review, documentation, and project management were also spelled out. In general, each customer

contract and matching VOA would include a Quality Plan addressing specific responsibilities for meeting customer requirements.

By the fourth quarter of 1996, the final versions of the Web Quality Policy and Procedures manuals had been completed. These documents were reviewed by the BFTC staff and then presented to Bill Adams for his review and use. These manuals will be used by Bill to set a minimal quality-level for all Web projects and companies, and should be useful when the Web's Quality Program is requested by customers.

Technology: Still Searching for a Proper Fit

Our experience in implementing a communications system for the Agile Web reinforced our view that relationships outweigh other considerations. To review, we had originally provided each company with a stand-alone computer and non-Internet e-mail and EDI software. Despite training and constant encouragement, usage was limited. Some members had no prior experience with e-mail and they had a hard time changing their habits just to deal with the Web. Others had internal e-mail systems that did not communicate with the VAN based Web system. To be used regularly, any technology must provide value to what people do on a day-to-day basis. Based on complaints about the inconvenience of the e-mail and the lack of Internet access, along with the recognition that enhanced electronic collaboration would be needed to support rapid collaboration within the Web, the BFTC staff proposed an upgraded system. In addition to Internet e-mail and World-Wide-Web browser capability, the enhanced system included video conferencing and shared applications, as well as a shared database accessible to the entire Agile Web. The members expressed interest, and development ensued.

By the middle of 1996 considerable progress had been made. Personal video-conferencing was installed using ISDN lines for all those companies having reasonably priced ISDN services in their calling areas. The systems were eventually installed at all but three companies. Internet access and e-mail was provided to all but two companies, which opted not to participate.

The greatest technical difficulty came in trying to provide e-mail access directly through the Local Area Networks (LANs) of those companies who desired it. Some did not want their LANs connected, while others did not have the technical skills to do the work themselves.

Furthermore, a number of internal systems were in a state of flux, as companies dealt with their own internal challenges and improvements.

The key factor concerning the technology, however, was not its technical difficulties but the fact that the Web members could not be induced to use it. As we discovered early in the experiment, without a compelling business reason to adopt a new technology, most companies will not take much time to learn it or think about how to integrate it with their systems. In a few individual cases, companies did begin using these capabilities, but only where it was required by a current customer or it significantly and immediately enhanced their operations. With a lack of substantial real-world Web business in 1996, the Agile Web provided little compelling reason to allocate time and money to these efforts. There were instances of EDI, video-conferencing, and e-mail being used by certain Web members, but these were driven by the needs of the members' current customer bases. We found only one member proactively looking for innovative uses of video conferencing, and that member has an internal partner-firm located in Europe. Hence, saving time and travel expenses gave this company a tangible reason to use the video system. Furthermore, members tended to invest in only enough training to deal with the immediate task at hand, leaving their companies unable to move onto more enhanced features.

Even in situations where there seemed to be an advantage to adopting the new technology, companies were reluctant to incur much risk in doing so. In one instance, a Web company attempted to video-conference with an out-of-state customer. The connection was made, but the camera image from the Agile Web company was not crisp enough to show the necessary detail on first-run parts. Thus, the customer could not approve the part. Faced with this initial failure, the company abandoned further efforts, despite several suggestions on how it might be improved. The company feared losing its credibility with the customer. Thus we have a Catch-22 situation in which the technology cannot be learned without practice, but the companies are reluctant to invest the time without an immediate return. Yet when an opportunity presents itself, the lack of familiarity with the technology presents too big a risk of embarrassment to be used. We realized the system would not be an effective collaborative tool for Agile Web unless everyone used it regularly, and this was not likely to happen in the short-run.

Because of these findings, efforts in the technology were reduced and re-directed to the more critical operational and marketing issues. It is our observation that the nature and culture of most small businesses is such that new technology must be applied to a pre-established, compelling business need. There is considerable reason to doubt that virtual firms will be formed to any great extent simply through some large-scale core-competency database, without first taking the considerable time to build trusting relationships.

In a similar situation, we completed a core-competency database developed in Microsoft Access and keyed in data representing at least a partial list of each company's competencies. Since the current information refers basically to equipment and processes, specialized skills and knowledge which often provide the key added value from the Web, would have to be added to complete the effort. The time required to reach this point was longer than originally anticipated due to a number of factors, both technical and human. The Web Competency Database provided an on-line ability to search for capabilities in the Web to match a customer's needs. This database can be modified as time goes on to account for new equipment, new member companies, or companies leaving the Web. This will be a valuable tool for the principals in AWI to make an initial cut when formulating their client resource teams. It should be pointed out that frequent visits by the BFTC staff and Bill Adams to the member companies allowed for a good understanding of each company's capabilities. In this way, much of the information in the database was well known by the AWI principals.

A New Initiative: The Evolving Agile Web Structure

As 1996 drew to a close and the end of the official pilot program approached, all of our efforts began to show real promise and value for the customers. Several customers who were initially skeptical of dealing with the Web now praised the Web and declared that they had made a very wise decision to use AWI. They recognized that Web took the burden of seeking resources to solve key technical design problems off of their shoulders. Furthermore, the Web provided a ready source of manufacturing skills in electronics, metal-working, and assembly so the customers were now free to concentrate on other issues, such as marketing.

It became obvious, however, that with the support by the BFTC soon to end, it was time to identify the human and financial support that Agile Web would need when AWI assumed full

responsibility for itself on January 1, 1997. The current AWI Board of Directors and the BFTC staff began to work to ensure a smooth transition. Of high priority was the very important matter of financing AWI. If the Web was to continue on its own and be self-sustaining, the member companies would have to commit their own funds to meet cash flow obligations until the revenue from customer projects began to pay for the operation of AWI. Otherwise, AWI would have to obtain loans, and thus incur a significant debt. The Board of Directors met with Bill Adams to put in place a plan for the member companies to fund the Web for 1997 and beyond. Based on a perception of the total funding needed and the ability of the Web companies to invest, they determined \$10,000 to be the minimum amount of financial contribution necessary from each company for it to become a contributing member of AWI. In exchange for their investment, companies would be issued shares of stock in the corporation. (Remember that up until this point the only financial obligation by the member companies was the original \$1.00 for one vote.) Legal papers were drawn up by AWI's attorney to change the Articles of Incorporation and the Bylaws, and to generate a Subscription Agreement for the purchase of the shares of stock. See Appendix P. We struggled with the original goal of giving all participants an equal vote in the Agile Web governance (one share, one vote) and the new need to provide investors a return for their risk and commitment. We decided to adopt two classes of stock. Stock up to the limit of \$10,001 would be designated as common-voting class A, and any shares beyond that would be issued as non-voting common class B. In this way, members contributing at least \$10,000 become the drivers in control of the future. Member companies could invest any amount over the \$10,001 and get corresponding dividend returns, but their votes would remain limited to 10,001. Finally, original members could retain a relationship by keeping their initial \$1 share, but their voting influence would be inconsequential.

In early November, 1996 a general meeting was held for all Web members. Bill Adams presented his proposed budget and financial needs for 1997, while the Board Chairman presented a plan for self-funding. The question of what happens to a member company that wishes to remain in the Web but cannot contribute financially was settled by agreeing that it could indeed remain a Web member. With only a \$1.00 financial commitment, however, it would have only one vote. The fact that the company had built relationships with the other

Web members over the past three years would allow it to be considered for future work by AWI, but its voting power and therefore potential dividend remuneration would be much less than the companies that made significant financial commitments. About one-third of the members pledged financial support under the new plan. The Board then asked Executive Director Mark Lang if the BFTC could provide matching funds through its traditional support for start-up firms. Mark pledged to take the request to the BFTC board, provided the Web investors did their part.

Subsequent conference calls between Bill Adams and the AWI Board members led to an agreement on a 1997 budget. Bill felt the need for a staff of three additional people to deal with more customer development as well as administrative tasks that were not a good use of his time. The Board was reluctant to make such a large commitment this early. The final budget called for the immediate hiring of one more employee to pursue specific relationships with larger customers, as well as funds to pay for office space and administrative support provided under favorable terms by one of the member companies to replace the staff support by the BFTC. At the same time, the BFTC's Board of Directors reviewed the status of the Web and Mark's proposal for a grant to match funds pledged by the AWI companies. The BFTC's Board approved the funding to be made as an investment in AWI. To prevent the BFTC from diluting the member's role, most of the investment was taken in a preferred class of shares to be issued for the BFTC only. These changes required that the legal documents again be modified by counsel and redistributed to all members.

In early 1997, Bill Adams held another full-Web meeting. He presented his budget, which had already been approved by the current Agile Web Board, for all members to see and discuss. He also introduced his choice for an additional person to join him on the AWI staff, Bob Montgomery, a former procurement manager at Lockheed Martin. Also at that meeting, the legal counsel for AWI presented the latest amendments to the Articles of Incorporation, the Bylaws, and the Subscription Agreement. The members approved all of the items, thus committing to the new structure for AWI. Two contributors pledged an immediate loan to AWI that would later be used as part of their investment, and these loans were matched by the BFTC. This allowed AWI to meet its financial obligations until the new legal documents could be finalized and the deal closed. The purchase of stock, and thus the funding of AWI, occurred

in March, 1997. A new Board of Directors was elected which now includes Bill Adams and the Executive Director of the BFTC.

This new organizational structure represented another step in the commitment by the members. As expected, it prompted some shake-outs. One of the 18 companies declared that its own individual internal company situation demanded all of its time, and formally withdrew from the Web. A few others initially considered making investments but later withdrew. The remaining members who did not contribute money will continue to be part of AWI. Thus, AWI has become a self-sustaining organization, with enough resources to carry on for at least nine months while revenues are developed. The future is not certain, but expectations are high based on recent customer experience.

Recommendations for Replication

We at the BFTC have taken some time to reflect on the experiences of the Agile Web Pilot Project. The following section contains our thoughts on what went right and what could be improved upon if we were to start over with the sole intent of creating a for-profit business. Through our review it became apparent that several areas could be improved upon, including the *Formation* of the organization, the *Start-Up* process, the *Operations* of Agile Web, Inc. (AWI), and an understanding of the *Resources* required to undertake such an endeavor. We hope these recommendations will be useful to other organizations seeking to increase competitiveness through collaboration.

Formation

As discussed in previous sections, the Agile Web Pilot Project was funded by governmental agencies as a test-bed for trying out new business practices, and was staffed by resources from a government-funded agency. It had a specific goal to prove out the concept of a virtual organization among SMEs, and it was funded and staffed by resources outside the supplier companies themselves. For any organization to be formed there must be a reason or goal for that to occur, otherwise why bother. Thus the first point to be made in this Recommendations section is really an imperative, and not just a recommendation: *There must be a valid reason for creating an organization like the Agile Web.*

Whether it be reactive or proactive, looking to capture new business or just trying to survive in the face of recent setbacks, there must be an explicit reason, a goal. The goal could be as simple as joint training, joint marketing, etc. If so, this type of organization does not involve cultural changes, and thus the reader can skip over much of what we are describing in this recommendations section. However, Agile Web started with a general goal of exploring agility in the manufacturing supply chain. This is probably too generic a goal to be successful without public funding support. It in itself will not lead to cultural changes and new values until it is put into the context of a business goal. Then the participating companies will rally around the

business goal. Also, future groups learning from our experiences will probably not need the extensive up front search for market opportunities that initially slowed the Agile Web group's progress.

For the rest of this Recommendations section, the goal for any group trying to replicate our organization will be assumed to be the creation of an independent, for-profit cooperative entity comprising a group of regional design-and-development and manufacturing firms. Given that premise, it should be pointed out that the Formation and Start-Up activities of such an undertaking could have major differences in implementation if the project was being driven and/or funded by an outside agency, as was the case for the Agile Web, or totally dependent on the participating companies. The goal of a governmental agency might be to increase the competitiveness of their local manufacturing community by applying funding, while that of a group of small supplier firms might be to band together as a consortium, with as low an overhead as possible, to provide more services to their customers. If the goal is a new type of business like Agile Web, Inc., it is better to have a principal driver or advocate from the business community.

Progress for our project really accelerated after the generation of the business plan and after bringing on board a president who truly believed in the concept and was staking his career on the success of the project. One note of caution however is to be aware that some people willing to take risks like this might not want to take the time to deal with the very important relationships issues up front. Here is a good example of where an outside agency could assist the process.

In each case the funding and resources could come from different sources. Based on our experience, we recommend that the funding from the companies be committed first and then matched by the government/public funds. Nothing makes the companies more committed and true stakeholders than having invested real money, time, and company resources up-front.

There are, however, many factors that would remain the same in all cases. It will take a sizable resource, and considerable time, to prepare a well thought-out set of criteria necessary to evaluate each potential participating company in order to determine how well they will "fit" into the organization. This effort could be done up front if all potential participating companies are known, or could build more slowly over time by starting with a small group and adding

companies as required. To do this will require numerous interviews, meetings, discussions, and company tours with each potential participant. The goals of the individual companies and why they would want to join must be investigated. At the same time, it is imperative that the companies be told in as much detail as possible just what will be required of them to participate, as well as what benefits to expect. The companies must see the value of their participation, since this self interest will propel them toward success.

On the other hand, the organization must be seen as more than just a free or inexpensive marketing agent. *This assessment process is very important in choosing the correct set of companies to be in the organization.* What must be somehow determined is the individual companies' willingness to work toward the goals of the new organization with an interest in growing their business, and not just wanting to preserve the business-as-usual approach.

The commitments required of them must be rendered explicit right up front so there is no misunderstanding after the organization is formed and in operation. Are the leaders of the prospective companies willing to commit to spending the time required, willing to involve their whole organization and the people in it, and willing to engage in innovative activities that heretofore might have been unfamiliar and thus perceived as too risky? Are the leaders willing to learn about new markets and new opportunities through working with their new partners and using all of the competencies in their own organization? Have they already begun practicing delegation to, and empowerment of, their employees, or are they patriarchal leaders afraid of compromising their own personal control? Are they willing to modify their business practices to enhance collaboration? If required, are they willing to make the commitment and then follow through to modify and improve their Quality Process? *In summary, a well thought-out assessment of a potential member's commitment is highly recommended.*

To be chosen, each participating company must add to the competencies of the organization. The core competencies of each company in the Agile Web project were investigated through an assessment process administered by outside consultants, from Lehigh University's Iacocca Institute.

Several major improvements to this process have been suggested and documented by the consultant. The new procedure appears to be a very powerful tool, and is recommended to be

used as a part of the formation process of new organizations similar to the Agile Web. See the second section of Appendix B.

Understanding core-competencies is essential to the success of a web. The Agile Web project had multiple companies whose base business overlapped, e.g. sheet metal, machining, printed circuit boards. There are pros and cons to having this overlap, but we would recommend having fewer companies than the Agile Web's 18 for the initial organization. Overlap provides a richer perspective of different industries and situations, and can provide multi-sourcing capability. On the other hand, overlap makes the building of close trusting relationships more difficult because of perceived competition. However, the core-competencies assessment pointed out that overlapping companies are not always competitors, because they might serve different industries (e.g., computers versus furniture). The organization really needs the "right mix" of participants. If all the companies are in similar markets or have CEO's with similar backgrounds, it is less likely that new opportunities are seen for the entity that are greater in scale or scope than for the individual participants. As noted, Agile Web found it important to create a new corporation and bring in a president whose skills and perspective were different from the member companies CEO's, thus adding to the entity's capabilities.

Companies must be able to recognize their specialized competencies and be willing to share information even with apparent competitors. Unwillingness to share will inhibit development of the organization. As an example, in our project, two printed circuit board (PCB) design and manufacture companies were asked to competitively quote on the same job. Although both had capital equipment to provide either a pin-through-hole (PTH) solution or a surface mount (SM) solution, one had the latest state of the market equipment to do the PTH while the other had the latest equipment to do SM. Due to the design of the PCB, the job was less costly when implemented in PTH. An open and candid discussion between these two Agile Web members led to this conclusion and the best solution for the customer was presented by the company with the PTH equipment.

If the web organization decides not to have overlapping companies it must be careful to prevent wide gaps in its competencies. They should recognize that overlap also provides more capacity and a choice of providers when bidding on jobs. It is also important to note that when

the organization is established and functioning there will be occasions when one company decides to expand its own competencies into areas that other members of the organization are already providing. The key here is developing the mindset to think partnering first, and of acquiring new in-house capabilities as a last resort. By the same token, the fellow member with the existing competency should also be willing to consider unique partnering arrangements. A web has to be careful of potential difficulties should members become direct competitors trying to serve the same customer base.

A key to the success of the new organization will be the types of relationships that develop between, and among, the member companies. What initially drew them together is important, but how they react toward each other after joining is crucial. *Geographic proximity* will allow them to build trust and confidence by meeting each other frequently and having eye-to-eye contact.

This building of trust and confidence was probably the key ingredient in the success of the Agile Web group. By geographic proximity we mean the ability to get into their cars and meet each other within a few hours. This allows them to accommodate the other demands of their home business by not keeping them away for too long. Being closely located also enhances rapid response. Physical parts can be transported between companies via a short truck-ride, instead of having to be shipped across the entire country. Also, having the members actually know each other prior to the forming of the organization helped in some cases.

Conceptual thinkers on the topic of Agility postulate that companies will be matched through electronic data bases and come together quickly no matter what the geographic distance is between them. This is fine for commodity purchases where risk of non-performance is low, but no customer will trust a key aspect of its product development to "unknown" suppliers. Close personal relationships are key. A possible extension of the regional web organization would be to have different regional webs begin to work together. The relationship could be web to web, or could occur due to companies within different webs having worked together in the past.

It should also be kept in mind that the leaders of the individual companies are obviously people, and as CEOs are accustomed to calling all of the shots. As such, the CEO-to-CEO relationships can at times get strained because not all the CEOs involved in a partnership can

call the shots in a single project. Egos do get in the way sometimes when one CEO and his/her company works under the direction of another CEO. What should be emphasized, however, is the *sharing of power*, rather than a taking of turns between absolute decision-makers.

Even during this formative stage it is essential that there be a “driving force” committed to the web as his/her primary responsibility. If the person(s) is an outside agent, e.g. a facilitator from an MEP or other governmental development agency, that person must ensure that the companies have the internal commitment and drive to make the organization a success. The companies cannot be passive—with an attitude of “when you have some business for me then call and we’ll talk,”—but must become immediately involved in the decision making. The commitment must include such things as money, time of key people and resources, and ideas about how to improve systems across the companies. It is important that the commitment be more than just words. The “driving force” person could be an outside agent, an executive on loan from one of the companies, or a paid employee of the organization itself—as is now the case with the Agile Web. It is worth repeating the point that *during the formation and early operation of the organization, the companies need to take ownership of directing the entity and not remain passive or just reactive.*

Start Up

The early operation phase of the Agile Web project consisted of multiple meetings of all the members. With some projects already brought to these meetings by prospective customers, the BFTC staff facilitated the forming of small teams, or “Virtual Organizations,” made up of subsets of the overall Web membership.

The sessions were designed to have the companies:

- actually start working together on real live projects so as to win business;
- get to know each other and build trust and confidence; and
- start thinking through what new business practices would affect and change the business-as-usual approach.

The few initial projects came from customer companies that were known to the BFTC staff and “friends of Ben.” Unfortunately, the projects were not chosen with much thought as to how the Agile Web would add value to the customer, beyond simply reducing piece-part costs. The customers currently had suppliers with acceptable quality and delivery, but wanted the Web to meet these criteria and then beat the current cost. In some cases these designs were highly labor-intensive, and the customer already had an off-shore supplier at low cost. Needless to say the Web did not win these early projects.

On the positive side however, the companies did get to work together and a considerable amount of trust and confidence was built up over this period. Despite not winning orders, these efforts started a process wherein the companies learned each other’s capabilities, found out that they could use each others talents, and started giving each other work outside of the Web projects themselves.

The shortcoming of this period was that there was no well thought-out plan of what the Web was good at doing. Another way of saying this is that the early operations of the Web evolved from the early projects it worked on, and was not matched to a business plan since at that time there was no business plan. The lack of numerous actual customer projects inhibited how rapidly we met and addressed key operational issues. A lack of initial orders could occur even with a business plan in place, and so it is recommended that the organization develop and use simulation exercises to force the companies to address early on some of the issues involved with doing business as an entity. If funding permits, these exercises could be developed by an outside organization skilled in that type of work.

Business Plan

After the companies are chosen, it is recommended that one of the very first steps be the development of a business plan for the organization. Any new business should start with the identification of the target market and development of consensus about that as a common mission or goal. Very intensive communications are required because people tend to use the same words but mean different things. The organization must draw this out of the participants and develop a truly common understanding of the goals. A good way to do this is to develop the business plan together as a group effort with all parties participating in the process. The

more concentrated and focused the firms are on practical issues, the more engaged they will become in the process. The plan should document the goal of the organization and be written by the member companies. It must express the “common vision” and a shared outlook of the organization. There must be individual and collective ownership of the contents so that all companies are committed to success. As with all business plans, it must identify the opportunities and marketplace that the organization will focus on, as well as the usual risks, barriers, and constraints of the marketplace and the new organization itself.

This exercise should focus the entity on where it can add value to its customers, and what activities need to be done to accomplish its goals. *The* value add to be addressed is that of the *total entity* as opposed to the individual companies themselves:

- What does the collaboration and synergy of the total entity bring to the table?
- What special opportunities can be addressed by the entity? and
- What barriers exist that will have to be overcome by the use of new business practices?

Organizational Structure

A key item to be determined is the actual legal structure of the organization. Once this is investigated and decided upon, many other issues will be resolved. Determine what form provides the optimal responsiveness and efficiencies for the particular markets targeted. Consideration of the legal structure of the entity needs to take into account such items as profit distribution to the member companies, profit retention by the entity itself, anti-trust issues, joint & several liabilities when working on projects, insurance, etc. This list could go on, but the point is that all such issues need to be discussed, and decided upon by *all* the companies. Legal counsel with expertise in new business start-ups and partnerships can add a lot of value to the process.

The Web considered incorporation as an S-Corp., a joint venture, limited partnership, as well as other organizational forms, before deciding on a C-Corp. Once the legal structure is agreed upon, other basic structural issues can then be addressed, such as, dispute-resolution, membership entry and exit, entity officers (e.g., President and Board of Directors), and what authority is vested in the officers of the entity to provide for rapid responsiveness and efficiency

of operation. Again, all these decisions need to be made in consideration of how they will affect and support the market strategy and the operation of the entity itself.

Once these decisions are made, the obligations of the member companies need to be specifically understood by all the companies involved, to make certain that there is no misunderstanding of what will be expected of them. What will their costs be to fund the organization? What resources will be required? What changes will be expected on their part to support the organization?

The Web companies initially addressed the way they would work together by generating a "Code of Ethics," signed by each company. Later on in the project, it became apparent that this Ethics Statement was necessary, but not sufficient. It lacked the details about the actual inter-company operations. Once again, the companies sat down and generated a document describing the "Principles of Operations" that would define how they will work together. The generation of both these types of documents is recommended to other organizations, and they should be done early in the life of the program. They need to be generated by the companies themselves, not dictated by a third party, and written down and updated as experiences in real-life situations warrant.

It should be noted that even after the companies went through the work of generating these operating principles, some of the key points were interpreted differently by some of the companies. Experience will suggest refinements to the Operating Principles, and a web should not cast its first effort in stone. It is recommended that each key point be probed and discussed with anecdotal examples used to clarify the meaning so that all parties reach a common understanding.

Operations

The Agile Web initially started as a loosely coupled organization without any formal legal structure. It was held together by the willingness of the companies to take part in an experiment, and by the availability of the staff and funding from the BFTC. Within the early stages of operation two key points were expressed by the companies themselves and the potential customers who were part of the original proposal. The Web companies decided that the concept of an Agile Web had merit and they wanted to make the collaborative efforts more

permanent. At the same time, the customers were saying that they needed a more tangible entity with which to deal. Customers began asking: Who they would contract with? What organization would be responsible and held accountable? How would warranty and field changes be handled? In essence, they wanted to know "who is responsible."

The entity itself now had a president and board of directors, and this satisfied the needs of both the companies themselves as well as the customers' concerns. The customer had a strong president to deal with as a single point of contact. Long-term relationships could now be formed. The AWI companies gave the president a high level of responsibility for project coordination and day-to-day operations. He could pick and choose which companies worked on each project and what resources were required from these companies. This gave a rapid response to the customer, while still keeping the companies highly involved. The bylaws of the C-Corp. were written so that there were constraints on the level of power given to the president regarding the approval of commitments and the disbursement of funds. For example, it only takes the signature of the president on checks up to a certain amount and then two signatures are required. This arrangement expressed the confidence in the president by the member companies, yet retained ultimate control by the shareholders.

Finances

AWI was started as a pilot program with the very broad goal of exploring agility in the manufacturing supply chain, and thus its initial financial structure was not necessarily representative of most networks. The initial structure had each company put up just one dollar and, in exchange, receive one vote in AWI. The dollar gave them a voice without any financial commitment. The one dollar/one vote achieved the goal of easy-in/easy-out membership, while also eliminating the added burden on the companies of having to file taxes for dividends and profits from AWI as shareholders. There were no earnings or taxes since AWI was designed to pass on all the profits, after covering expenses. The lack of AWI assets helped address anti-trust issues. Again, the advice of legal counsel is highly advised.

Most future Web-like organizations will not have the benefit of public seed funds and the companies will have to deal with how they fund the operation. *It is recommended that even*

when public funds are initially available that the companies look ahead to the time when the funds expire, and form their initial organization with that in mind.

If an organization is started as a corporation without the benefit of public funding, a sale of stock is one way of raising the necessary operating capital. Indeed, this is what the AWI financial structure evolved to, as the public-funding portion of the project came to an end. The selling of shares to raise operating funds so far has worked out well. This may be a good structure for organizations such as manufacturing networks where little or no overhead is required and the goals are more traditional.

Quality

The quality process represented another key topic that the organization had to face. Customers asked about the "Web's Quality Plan and Process", since the customer was contracting with AWI and not directly with one of the companies. They asked: Who was responsible for the quality of a product from the entity, and where was this documented? This led to the Web contracting with a consultant to review the quality process at each of the individual member companies, and then generate a Quality Manual for the entity. It is a subset of the ISO-9000 standards, deemed by the consultant as the minimum required for each and all of the companies to achieve and maintain.

We would recommend that other organizations perform an assessment of the quality system for each company to determine what is already there, and to establish a minimum standard for all to meet. Document this system and develop manuals. The documented system-manuals can then guide the creation of project-specific "quality plans." These explicit quality plans will be an essential ingredient in building confidence among the member companies, and between the entity and the customer.

Technology

Technology should not drive the new business practices; rather, the reverse should be true. We recommend that the business plan and operating procedures be established first, and then technology be used to improve the effectiveness and efficiency of the new practices. To do this, as with the quality plan, we recommend that an assessment be made of the technology

currently in use at each of the companies involved. With that as a base, the next step should be to understand where technology can be used to improve collaboration. Make certain that the technology chosen is driven by the processes and operating procedures to be performed.

We found that without a driving reason for using the technology, it will not be used. The current communications methods of fax, telephone, and voice mail are quite effective for traditional business practices. The Web actually installed a system allowing for E-mail, EDI, video-conferencing, application sharing, and white-boarding, and we developed a capabilities database for all of the companies. We found that the new technology will only be used to its fullest extent when driven by the need to satisfy the customer. Finally, the Electronic Commerce Resource Centers (ECRCs), available in most parts of the country, are organizations highly capable of helping with the choice of, and training with, information technology. The ECRCs are publicly funded and are truly there to serve.

Cultural Migration Toward Agility

Cultural migration by the companies and the development of their workforces to be able to understand, accept, and then practice the changes required to operate as an agile company are very difficult tasks. These changes are not easy to articulate, let alone to achieve, and initially it was difficult to delineate the internal changes necessary to realize our broader aims. *It is essential to choose companies that have CEOs who, themselves, can look for opportunities beyond their own company's capabilities, and who will also encourage their employees to look for additional opportunities made possible through a web.*

The companies must be willing to have all employees within their firms get involved with the Web. This will require the CEOs to be willing to improve the communications within their companies, and follow through with any training required to make cross-company partnering happen. Of course, this will not occur if the CEOs themselves do not understand what is required to develop flexible organizations that are assets to their web. Once again, it is recommended that the companies, and thus the CEOs themselves, be measured against these attributes during the initial assessment and formation process.

We found that all the companies in AWI could make use of this training to some degree to enhance their collaborative attributes, and in the cases where we actually got the CEOs and

company personnel involved, they began to see the new customer opportunities they could address through the Web. We recommend that local resources be sought out to train the members in teaming and problem-solving skills. This training should be made available at all levels of the companies. Cross-company exercises and simulations are very useful in preparing for actual customer projects.

Marketing

When marketing the Web it became obvious that there was a need to target customers looking for the value added that the entity as a whole could provide. That said, we found that the Web could be attractive to customers of various sizes. The start-up customer is attracted because the Web offers a readily available resource of capital equipment and manufacturing know-how. The mid-sized customer, with enough internal resources to satisfy the marketplace for his current product line, but without the extended resources required to develop and manufacture the *next generation* of product, views the Web as an extension of his own company. The Fortune 500 company that is downsizing and outsourcing parts of its business sees the Web as a single-stop provider of those needs.

We found that start-up company personnel very quickly picked up on, and understood the value of, dealing with the Web. Early-stage firms have fewer options to get their product to market quickly, but they are also more open to innovative collaboration.

The Fortune 500 size companies had a different set of hurdles to overcome. Although they were quite vocal in praising the Web and the new business practices it represented, when it came time to actually engage the Web, they became reluctant to proceed. We believe this was due to two main problems.

The first problem stems from the organization of the Fortune 500 customer itself. There is a large gap between the visionaries in management, who grasp the Web's connection to their own organization's desire to become more competitive by out-sourcing, and the people that staff their procurement functions, who do not. The procurement people are still looking for traditional economies in commodity parts based on low-bid alone. They want to control the suppliers, and do not appear to want suppliers to bring any other capabilities to the table. They seem to be saying, "Here is what I want, get it to me a.s.a.p., at the right price and quality, or

I'll go somewhere else. Don't bother to suggest improvements in the product or processes; that's my job." We have had the experience of a procurement person telling the Web marketers that "You are taking away my job by providing services, such as coordinating suppliers and adding value to the product." To overcome this problem, the customers must have their total organization understand the value added by the Web, and be ready and willing to accept the use of that value.

The second problem lies squarely in the lap of a web itself. The web must be able to articulate very clearly the advantages it can provide, and this story must be told by the entity personnel such as the president, as well as all the employees of all the companies in the web. The web people must have an integrated and focused approach to describing themselves as a seamless entity, above and beyond just a single point of contact. This united approach must be practiced and understood by all members. *We recommend that considerable training and discussion occur on portraying the Web as a seamless entity prior to formally presenting the Web to a major customer.*

One important question to address is why AWI did not have many customers during a considerable portion of its early life. (It should be pointed out that it is currently enjoying an ever-increasing set of customers who are able to understand and take advantage of AWI's capabilities.) The original customers were the wrong customers for AWI. They were not looking for value add, only for lowest cost. It was a build-to-print mentality and was not recognized by the Web as such until considerable time and resources had been spent in preparing quotes. These customers provided us with a set of expensive lessons learned on what makes a good customer, and how the Web must present itself to make the customer understand what we bring to the table. If the organization is marketing new business services like AWI, one needs to educate the customer and expect a longer initial sales cycle. The key is to make the added services appear as much like the current system as possible, to reduce the perceived customer risk. Also, do not take business that doesn't fit your goals. Refusing business is hard for a new organization to do.

In other cases, the Web was overpriced. The reasons for this varied. There were instances in which the customer's current supplier or another bidder just had a better price, period. Sometimes the Web members were not "hungry" for new business because of their current

workloads, and thus did not offer their best price. Projects with multiple web companies bidding need to be managed carefully with regard to how one company's bid will affect the other companies. By having a high bid on its portion of the project, one company in the Virtual Organization can lose the project for all of the companies. This can cause internal friction within the web. *Participants must be willing to be price competitive, even if only marginally profitable, to get business and develop customer relationships, so that eventually they can move on to high value-added projects.*

On a few occasions, we found that the Web's quote was higher than the customer had anticipated, but was competitive with the other quotes the customer had received. In these cases, the customer did not have a reasonable idea of the ramifications its design was going to have on costs. The customer often compounded these problems through an unwillingness to partner with the Web, and a refusal to share its market information and desired cost/price points. Lack of openness and candor on these financial items resulted in various difficulties. The customer sometimes lost a market presence, cost the Web a project, or wasted time and money in not realizing that a project should be abandoned. The Web offered to sit down and discuss alternative proposals but was cut off by an unwilling customer that was still working under the paradigm of "us and them."

In other cases, companies in the Web were reluctant to bring their own customers to the Web for fear of exposing them to other potential competitors in the Web, and also because of a lack of confidence that other companies would meet their commitments. For the most part, these fears have now been overcome. Web companies are bringing customers to the Web to provide and bid on the *total* customer needs, not just their own individual part of the package. There is still, however, an apprehension and tentativeness toward sharing costing and financial information, and this limits the acquisition of new business. Not collaborating effectively to reduce price should be overcome in time, as the relationships continue to build. The appeal of the new entity and the excellent exposure to new markets that the new business approach of the Web has generated continue to bring in new customers.

To help customers realize the potential of a web:

- Target customers who are receptive to new ways of doing business;
- Make sure the web is expert enough to articulate the value-added possibilities when talking to a new customer;
- Make sure the web has the ability to locate customers interested in the new value-added possibilities; and
- Follow through with a concerted approach to penetrate new markets.

Resources Required

Finally, we must point out that any group wishing to start a new organization similar to ours should recognize that *there will be start-up costs required to reap the rewards of working together and developing new markets and new customers*. The entity will not come free, even if there is public funding available. Sooner or later the entity must stand alone and be self-sustaining. To do the job right will require resources and dollars. Leadership and driving forces necessary to coordinate the companies efforts, to market the entity, and to make the venture a success will require skilled resources that do not come cheaply. Be prepared to pay for quality work. Do not expect the leaders to also handle the administrative support required. Separate that work from the burdens of leadership and be prepared to pay for this support, or be prepared to provide it from the resources of the companies involved in the entity. In both cases, where marketing is done by hired resources or by the companies themselves, take the time to train everyone so that there is a common message.

The new entity will initially have to fall back on the reputation of the member companies. Image, however, is important, and the entity must look like and sound like a “real company”; customers will be reluctant to engage an entity that seems less than stable. Establish a physical office with all the usual office communications equipment (e.g., phone, fax, copy machine), even if it is initially at one of the member company sites.

We hope that the experiences of the Agile Web can provide some guidance in achieving effective collaboration throughout the country. The Agile Web Pilot Program held a Report-out Conference on March 20, 1997 to review the complete project. See Appendix Q. We wish you good luck in all your efforts.

Appendix A

Agile Web, Inc. in Relation to Global Trends in Cooperative Activity

For the small firm, responding to widely divergent and demanding opportunities in the global economy can prove especially daunting. Rather than a challenge of mobilizing and configuring internal resources, as may be the case for a large corporation, a small or mid-cap company most likely will not possess all of the resources necessary to meet an opportunity. Where will a company obtain them? The answer will likely be: by partnering with other firms who likewise need capabilities they do not possess. Together, however, groups of companies can combine their resources and thereby thrive in an environment of continuous change.

It is especially important for the small manufacturer to find strategies for survival. The national economy and the national defense both depend on the continued success of small business, particularly in the manufacturing sector. While statistics are regularly trotted out to demonstrate the critical role small business plays in job growth, the crucial importance manufacturing will continue to play in advanced societies remains less understood. Cohen and Zysmen point out that, despite visions of a "post-industrial," service-based economy, "manufacturing matters mightily to the wealth and power of the United States." Although the service sector of the economy is obviously important and growing, *its* continued health is directly tied to manufacturing. Attacking the "myth of a post-industrial economy," Cohen

and Zysman convincingly argue: "Lose manufacturing and you will lose--not develop--those high-wage services."¹

For small manufacturers to survive and continue to provide a domestic production base in the service of defense needs, some of the challenges are becoming clear. Tighter integration and the ability to add value beyond simple commodity production is becoming increasingly vital.² Instead, as experiences in the automobile industry demonstrate, increasingly "component manufactures are being asked to shoulder new, often complex, responsibilities." More than isolated examples, these demands reflect conditions that are now minimal to market entry, and which are "forcing suppliers to become full-service manufacturers."³ But in constantly changing circumstances, how can one company acquire and maintain all the necessary capabilities? Increasingly, successful companies are finding that solutions cannot be found entirely in-house, and instead are turning toward inter-firm collaboration.

¹The authors insightfully argue that the belief that a service economy represents a logical evolution paralleling an earlier shift out of agriculture to manufacturing is predicated upon an erroneous view of history. Instead of the U.S. economy shifting out of agriculture, they argue correctly, *labor* shifted out of agriculture as machinery and chemicals produced enormous gains in productivity. As agriculture remains central to a manufacturing economy through various linkages, so will manufacturing continue to be critical to an economy that includes a prominent service sector. Stephen S. Cohen and John Zysman, "The Myth of a Post-Industrial Economy," *Technology Review* (February/March 1987): 54-62.

²See, for example, David Friedman, "The Enemy Within," *INC.* (October 1995): 47-52.

³"Quality and Productivity: American Suppliers Confront an Ever-Widening Gap," National Center for Manufacturing Sciences, *Focus* (July 1995): 1-7.

Inter-firm Collaboration at the Small-Firm Level

The originators of the concept of agility stress that "in an agile organization, cooperation enhances competitive capability." Touting "virtual enterprise" as a key method to meet market opportunities in the highly competitive global economy, the proponents of agility emphasize that successful competitors must "use the virtual company model inside and outside to share responsibility and enhance cooperation opportunistically across organizational lines to enhance competitiveness."⁴ Collaboration among businesses, while a central component of agile manufacturing, is not, in and of itself, a new phenomenon. Indeed, the visibility of various partnership arrangements around the globe has markedly increased in recent years. For example, the Japanese, so often emulated in recent times, boast more than 46,000 enterprise cooperatives.⁵ Likewise, Danish and Italian manufacturing networks have been much discussed recently. In the context of worldwide developments, Pennsylvania's Agile Web can thus be seen as part of a broader sweep of changes taking place in inter-firm relationships emerging in recent times. As will be seen,

⁴Steven L. Goldman, "An Agility Primer," *Agility Reports* (Bethlehem Pa.: Agility Forum, 1994), p. ii.

⁵Motoko Yasuda Lee and Charles L. Mulford, "Reasons Why Japanese Small Businesses form Cooperatives: An Exploratory Study of Three Successful Cases," *Journal of Small Business Management* 28 (July 1990): 62. Although the more vertically oriented Keiretsu are often discussed, these authors address horizontal and independent firms cooperating in "Kyodokumiai."

however, the specific design and purpose of Agile Web, Inc., make it unique in the landscape of the myriad cooperative arrangements that have lately appeared.

Until recently, discussion regarding business collaboration has focused on the large firm, with an especial emphasis upon the relative merits of licensing, joint ventures, alliances, mergers, and other legal arrangements that might best suit the strategy of multinational organizations.⁶ By the 1980s it appeared as though the trend of business collaboration was on the upswing. As international competition had increased pressures on cost minimization, by the early 1980s managers were reporting that the use of cooperative agreements had "increased markedly in the last 15 years." Managers also reported that whereas firms were previously "too busy building up [their] own capacity," by the 1980s, with decreases in demand growth heightening competition, firms had begun engaging in cooperative arrangements that "would have been impossible 15 years ago."⁷ Signs of a broader trend toward business collaboration at all levels first appeared at the multi-national level, among what observers recognized as "technologically complementary" firms. That is, firms tended to enter cooperative agreements when motivated by the opportunity to share technology with another firm over an extended period if the technologies could be combined into new

⁶For example, Michael E. Porter and Mark B. Fuller, "Coalitions and Global Strategy," in Porter, ed., *Competition in Global Industries* (Boston: Harvard Business School Press, 1986), pp. 315-43.

⁷Mariti and Smiley, p. 447.

products or services.⁸ In the mid 1980s, commentators began remarking upon what they perceived as a growing phenomenon of cooperation in the global marketplace.⁹ While some studies disagreed on the exact characteristics of the various trends, collaboration and its role in corporate strategy, nevertheless, began to receive considerable attention.¹⁰

While up through the last decade, virtually all of the discussion on collaboration has been aimed at large organizations, the emergence of the Agile Manufacturing paradigm has, in fact, pointed toward the need of the small firm also to take action. As smaller firms have been forced to respond to challenges similar to those that have driven developments at the higher levels, they too have recently found the need to move into the arena of inter-firm collaboration. Consequently, with global forces penetrating even the strongholds of what once had been considered completely domestic industries, collaborative arrangements have, by the 1990s, become rather widespread throughout the world.¹¹ What is more, recent

⁸P. Mariti and R. H. Smiley, "Co-operative Agreements and the Organization of Industry," *Journal of Industrial Economics* 31 (June 1983): 440-41. According to further research, however, collaboration was significant among firms which could gain mutual advantage through technological interdependence, but not *ipso facto* as a result of being high-technology firms as measured by high R&D levels, see Porter and Rawlinson, pp. 345-46.

⁹Ibid, pp. 446-47.

¹⁰See, for example, Pankaj Ghemawat, Michael E. Porter, and Richard A. Rawlinson, "Patterns of International Coalition Activity," and Michael E. Porter and Mark B. Fuller, "Coalitions and Global Strategy," both in Michael S. Porter, ed., *Competition in Global Industries* (Boston: Harvard Business School Press, 1986), pp. 345-66, and 315-44.

¹¹Goldman *et al.*, among others, note that while one's business might presently remain both domestic in operation and in its markets, potential competition in all sectors looms just around the corner from foreign firms who threaten to do it better, faster, cheaper. Thus, in this sense, all business has become global.

collaborative efforts among small to mid-cap companies have included sharing of information, technology, expertise, and access that would have been "unthinkable in the past."¹² Responding to different business, legal, and political environments, these inter-firm arrangements have evolved in various hybrid forms.

European "industrial districts" represent one form of small-business collaboration. Flourishing in Denmark, West Germany and Italy, regional networks of manufacturers consist of "specialty producers that work together to produce complete components and finished goods." Supported by regional, as opposed to national, government entities, these networks allow members "to cope with rapid changes in technology and markets" by combining resources and sharing costs with other firms to pursue joint R&D, production, and marketing.¹³ Such cooperation thus allows very small companies--many with under 50 employees--to penetrate international niche markets in sectors ranging from electronics to metalworking to hydraulics.

New forms of business relationships have emerged in Japan as well. According to Yasuda-Lee and Mulford, who have explored Japanese cooperatives, small firms participating in co-ops in Japan are encouraged by the government and supported through

¹²Janet E. Forrest, "Strategic Alliances and the Small Technology-Based Firm," *Journal of Small Business Management* 28 (July 1990): 40; and N. Alster, "Electronics Firms Find Strength in Numbers," *Electronic Business* 15 (May 1986): 101-108.

¹³Robert Howard, "Can Small Business Help Countries Compete?," *Harvard Business Review* (November-December 1990): 96-97.

loans, legal assistance, and exemption from anti-trust laws. While "the function of these cooperatives is to assist in the survival of member firms as individual organizations," the joint management structure of each organization has substantial power over joint activities and provides considerable resources. The services, which each cooperative can legally provide, include joint production and manufacturing, joint acceptance of customer orders, joint purchase of goods, joint sales, joint storage, joint transportation arrangements, loans and loan arrangements from governmental and private sources, assurance of loan payment for member firms, education and information, premium payments for national labor insurance, facilities for joint business and recreational purposes, provision of joint emergency-relief funds, testing of products, negotiation of minimum wage among member firms, and collective bargaining.

Obviously, this assistance provides considerable advantage to the member companies versus the option of going it alone. As companies confront various issues affecting their future security, the direct assistance thus provided, not surprisingly, serves as the prime motivator in encouraging individual companies to participate.¹⁴ In the manufacturing group studied by Lee and Mulford, some overlap of the companies' capabilities existed; however, they found that "even though competition exists, the diversified goods manufactured and sold by them tend to decrease competition and, in fact, these firms create somewhat

¹⁴Ibid, (Lee and Mulford), pp. 66-67.

symbiotic relationships among themselves because they refer customers on a commission basis."¹⁵

Smaller firms in the U.S., too, have begun moving into various alliances and cooperative arrangements in search of competitive advantage. Among the most visible have been the groups functioning in association with USNet, "a consortium of public and private development- and manufacturing-assistance organizations in 15 states working cooperatively to help small firms use inter-firm collaboration as a strategy for manufacturing competitiveness."¹⁶ Five specific groups affiliated with USNet, and whose efforts have been briefly documented, include The Western Massachusetts Chapter of the National Tooling and Machining Association (NTMA), the West Michigan Manufacturers Council, the Philadelphia Woodworking Initiatives, the Northeast Indiana TQM Network, and My Oregon Home, Inc.

Unlike Agile Web, inc. which is a for-profit corporation composed of member companies across several industries, these USNet groups are either industry-specific or are support- and training- oriented. For instance, the Massachusetts group is a business training and

¹⁵Having member firms of similar capabilities (and the issues of their compatibility and willingness to collaborate) parallels the composition of Agile Web. Although the use of commissions as motivation represents a more traditional practice than that for which the Web is striving. See below (? motivated by agility, recognizing collaboration and cooperation actually *enhance* competitiveness).

¹⁶Broadwell, et al, "Common Purpose, Common Sense: Case Studies in Inter-firm Collaboration," (Cambridge Mass.: RTS, Inc., 1995), p. iii.

information-dissemination support agency that runs an apprentice program designed to assist metal-working firms in the Connecticut River Valley. Similarly, the West Michigan Council and the Indiana TQM group, through inter-firm cooperation, provide information and training support to its member companies in things like Total Quality Management, Concurrent Engineering, and Improvement Teams. They are not, however, designed to support inter-firm *production*. The Oregon and Philadelphia initiatives, on the other hand, target inter-firm collaboration in production and marketing, but are focused efforts among a few firms working together in the furniture industry, and thus resemble more traditional joint ventures.

Other consortia certainly exist, often organized as manufacturing networks. Examples such as TECMEN, however, differ from Agile Web in that once a customer is procured by the marketing arm, the various members of the consortia then bid competitively amongst each other. Unlike Agile Web, which is designed to be collaborative and cooperative through and through, TECMEN is a grouping of companies which then remain in competition internally. As such, the member firms lack the amount of inter-firm sharing of information that remains a central component of Agile Web's approach.

Apart from the USNet and TECMEN examples, networks come in many forms and provide a wide variety of services for their members. While some do in fact aspire to the level of integration being sought in the Agile Web project, on the whole they are more support oriented. That is, they are designed, for the most part, to help individual companies

meet the demands of a production project for which each alone is then responsible. These groups convey an image of cooperation with respect to obtaining and maintaining resources and services which all members can use, but with respect to individual contracts, each constituent company appears to remain independent.

It must be noted, however, that this distinction is not always accurate. Rinehart argues that networks, too, can increase the degree of linkages among its members to the point of cooperative production. And the language he uses to describe collaboration in networks calls to mind the concepts that are being touted as uniquely "agile." Conjuring up the image of virtual enterprises, he states that "networks allow independent small- and mid-sized firms to cooperate locally in order to compete globally. Network member firms collaborate on projects that generate profits but constantly remain flexible, ready to regroup in order to seize the next market opportunity."¹⁷ It seems that the lesson to be learned is not to get caught up in the taxonomy of "network" versus "web," but, instead, to look at what companies are actually doing in terms of cooperation and collaboration. Here, the differences between Agile Web's objectives and the activities of other groups will become more apparent.

¹⁷Eric Rinehart, "Manufacturer Networks as a Competitive Strategy," p. 12. The point needs to be made that virtual enterprises, in the eyes of the originators of the concept, are not necessarily mutually exclusive with respect to networks. Virtual enterprise is only a higher level of integration with respect to a production project; they make no definite prescriptions for the broader infrastructure that will support virtual enterprise formation. Goldman, pp. 221-26?

The rationale for setting up various cooperative mechanisms around the nation has varied. Several of the more prominent initiatives have been inspired by the need for regional economies to ensure the survival of locally important industries. Groups like the Kansas Manufacturers Association provide one example. The founders of Agile Web, however, set up their organization with a different purpose in mind. Following the lead of the TRP program, Agile Web's designers were interested in moving presently successful companies into the next generation of manufacturing and business techniques. They sought to engender a thriving dual-use manufacturing capability in their region by putting into place the newly emerging prescriptions for agile manufacturing.¹⁸

Sensitive to trends in industry, the state of Pennsylvania's Ben Franklin Technology Center (BFTC) had been exploring ways to facilitate inter-firm partnering. These had included experiments like "LINC," which explored connecting job shops through PC-based CAD/CAM systems in a pilot procurement project with a local army depot, and another venture, entitled, "matchmaker," which examined the use of database systems to match customers with suppliers. The crystallization of the "agility" concept, however, placed a

¹⁸The results of this have been mixed. While agility depends on a progressive corporate outlook, it also demands a commitment. Thus, while companies in trouble often have along way to go in moving toward agility, they do have sufficient motivation. On the other hand, companies which are successful with their current practices often lack the strategic commitment to move to the next level of competitiveness. Strapped by such complacency, Agile Web members have been reluctant to place a high priority on project initiatives.

renewed emphasis on the very real and critical need for small regional manufacturers to enhance their capabilities through collaboration and cooperation with other area firms.

The support team for Agile Web has been striving to make the Web a unique organization that will respond to the evolving needs and emerging challenges facing supply chains in a dual-use economy. Rather than mimic collaborative approaches already existing, in setting up Agile Web the BFTC team sought to establish an inter-firm association truly based on the principles of agility. Consequently, much of their effort has been targeted at improving the capability of firms to actually come together to form an integrated response to a market opportunity.¹⁹ Central to this task have been the steps taken to fully coordinate and mesh inter-firm communication and project management, so that firms can move beyond the network model toward full integration irrespective of geographical space. And unlike externally-oriented support networks, the Agile Web project has also been focusing on the internal business practices of each of the participating companies. More than just an attempt to ensure their survival, making each organization into an agile competitor that can thrive in a global economy has been an underlying goal of the project from its inception.

¹⁹For a discussion of the need for a high value-adding and highly integrated supply chains, see Friedman, "The Enemy Within," *INC.* (October 1995): 47-52.

Section 1

Agile Web Inc.'s Core Competencies: Lessons Learned

By

Devia Napoleon, Nagel Roger N., and Nickel Ted Y.

Abstract

Determining competencies in Agile Web Inc. is ground-breaking work because it is a novel type of organization. A review of the process followed reveals useful insights regarding the challenges encountered and the course of action taken to overcome them. Lessons learned include the systematic nature and structure of competencies as applied to virtual organizations and agile webs, the fundamental role of group entrepreneurial abilities in the core competencies in this type of organization, and the interactive evolving nature of the assessment process and its results.

1.0 Introduction

The pace of growth and competitiveness of the American enterprise system has been set by, among other factors, the innovativeness of many small, medium and large companies, each earning a place in the value chain competing in a free market.

As American companies streamlined their supplier chains, seeking to increase their competitiveness against Japanese companies, there were concerns that the strategically valuable sector of small and medium-sized firms could shrink beyond appropriate levels -- with foreseeable negative effects for long-term competitiveness in the commercial and defense sector as well as in employment.

Small and medium-sized firms can respond to the challenge of maintaining innovation and low transaction costs by using virtual organizations to proactively and quickly reconfigure the supplier chain. Such a response plays to the strengths of the American industry in computer and communications infrastructure. But in order to reap its benefits, new practices need to be learned. Most importantly, the methods which can quickly introduce and instill those practices in a nationwide business culture need to be found and mastered.

Building upon concepts developed in the landmark report "21st Century Manufacturing Enterprise Strategy," (1) the Ben Franklin Technology Center leadership decided to pioneer the idea of proactively creating an Agile Web as a means to nurture the formation of virtual companies.

During the spring and summer of 1993 officials from BFTC brought together 19 companies which comprised a regional "web" of suppliers within the electronics and mechanical industries from eastern Pennsylvania to participate in the Agile Web project. The companies had \$250 million combined annual sales, 2100 people and more than 1.2 Million sq. ft. of facilities. All companies were at the time successful in the market; most of them had entrepreneurial individuals, and some were considered competitors. Under the BFTC guidance, they agreed to invest the time and talent of their leadership as their initial commitment.

In October of 1993 the BFTC was awarded a \$2 million grant over two years from the federal government's Technology Reinvestment Project to determine how agility could be applied to small to medium-sized companies. Since then Ben Franklin officials, chief executives of participant companies and some consultant groups have

been actively working to turn the Agile Web into a commercial reality.

BFTC asked the Iacocca Institute to help the Agile Web leadership to succeed in materializing the web by contributing agility expertise and skills during the initial phase of the project.

2.0 Assessment Approach

Since agile webs are new entities and there is no information on how to organize them effectively, the Iacocca Institute proposed an interactive assessment to identify, gather and distribute data on factors that would help participants to group together. The approach was not only to find and report data, or to help uncover motives and opportunities for building customer value, but also to use the interactions to increase the awareness of opportunities because of the Agile Web's existence and the commitment to cooperation within the web.

2.1-Objective Definition

Two initial challenges were identified early in the project. The first was to facilitate changes in people's perceptions and ideas about the present and future competitive environment in order to speed up the process of relationship building around the purpose of the Web. The second was to create a common knowledge base to enable the project's leaders to make informed decisions about the management of the project while the Agile Web was being formed.

The stated objective of the assessment was two-fold: to determine the combination of individual firm competencies, and to put in writing a set of explicit statements about the behavior that they were committed to embracing in the new entity. The assessment became a means to help all

participants determine who they were as a collective entity.

2.2-Assessment Rationale

The assessment team approached the process as a set of consensus-building interviews and meetings among Web participants. Since peer cooperation is fundamentally different from the hierarchical way in which decisions are usually made in organizations, the assessing team's intent was to help the leadership of Web-participating companies to begin shifting from a command mode to a coach mode in the new entity. Based on previous experiences of emerging agility practices, the assessment team proposed building allegiance to the Web by encouraging participants to take ownership of the Web's activities and outcomes. The team intended to accomplish this goal by assisting participants to choose and to elaborate on the specific outcomes of the Web's tasks.

It was expected that if such allegiance was created, and constantly fueled by agility knowledge and rewarding initial experiences, then the Web leadership would be motivated to find the appropriate solutions for obstacles to web formation.

If done appropriately, the consensus-building process could stretch participants to adopt behaviors within the web that were not being used in their individual companies. What was considered important at that time was not that they were accustomed to "agile behaviors" or could demonstrate past experiences in such modes, but rather that they demonstrated a strong commitment to behave in the new way within the web.

Not only would companies learn new ways to behave, but also, if successful, web experiences could help individual companies to transition internally into agile competitors.

As suggested in the book *Agile Competitors and Virtual Organizations*, (2) which introduced and pioneered the concept of agile webs, it was decided to start the exploration by linking core competencies as the assessment theme.

There is not a clear, generally-accepted definition of what core competencies are, nor an agreed-upon method to determine the core competencies of an organization. Building upon some of the Leonard-Barton (3) and Prahalad and Hammel's (4) description of core capabilities or competencies, the team used agility knowledge to quickly elaborate a new approach that looks for all types of core competencies.

In the new approach the assessment team categorized competencies in a pyramidal structure. On top is a company's value system. The base is formed by a company's managerial, technical and skill and knowledge systems. Competencies might exist within any single system as well within as any combination of them. Thus, although the team started using competency category names similar to those used by Leonard-Barton, the concepts associated with those categories are broader in meaning and therefore different. For example, the phrase "value system" was used to mean not only the collective hierarchy of preferences but also the beliefs, motives, and ethics that cause all other behaviors to be adopted.

The assessment team's premise was as follows: if the core competencies of individual companies were assessed for common traits, then the shared set of traits would become the common foundation of core competencies in the Agile Web. If these core competencies were stated explicitly and emphasized continuously in daily web operations, so that the web operations were perceived as a clear, separate and distinctive

organizational environment, then the web would speedily become a synchronized organization.

Based on this rationale, the assessment team used a set of open inquiries that ranged from direct questions about core competencies, ethics, and culture, to questions dealing with derived managerial, skills and technical issues. All of the questions were intended to uncover common competencies and the origins of such competencies.

2.3-Assessment Guidelines

The assessment team had major decisions to make. How exactly would they accomplish their task through their initial interviews with each web participant? In other words, what would the assessment execution criteria be? These decisions, in turn, shaped the assessment activities as explained below.

2.3.1-Emphasis on New Thinking: Agility

The team effort concentrated first on disseminating among participants the agility knowledge considered adequate to the initial tasks for web formation. The fundamental concepts of virtual organizations and webs, as well as relevant agility principles, were introduced through interactive group lectures and discussions. The intended purpose of these activities was to propose a substitution: new possibilities based on the collected knowledge of agility instead of old techniques based on mass-production.

The main agility principles that the team emphasized were simple but profound: how cooperation enhances competitiveness and what essential elements are required to nurture cooperation. Major areas of concern were sharing information within the web, sharing customer bases, and liability issues. Therefore several agility concepts were emphasized in each company according to their specific balance of perceptions on these issues. The team also explained the

possibility of adopting different behaviors within the web as a means of acquiring a nurturing and enriching experience. The team explained that successful initial experiences would build trust and commitment to the new practices and to the web.

In each interview, and depending upon each management team profile and interests, several key issues were addressed: the need for an increased awareness of the business importance of cross-functional teams; personal relationships; openness and trust as a means to build commitment; the relative value of the various kinds of company assets; and the role of business values.

Such interactions were not lectures on how things should be, but rather candid conversations in which the management team was led through guided self-reflections to state the real reasons behind actual company practices and behaviors. For example, an interview was interrupted by a telephone call from a company representative that was servicing a customer. The CEO remarked that the company was helping the customer even though there was no legal reason to do so. Analysis of the situation guided the CEO to think about what made him act that way. He realized the high value he placed on that customer's relationship over time. In fact, he was applying agility principle.

The example above also describes another challenge to assessment. Even though companies might use some procedures rooted in common values, they express these "roots" at different levels of depth. As one might expect, companies use different words to mean similar things and similar words to mean different things. To overcome potential confusion, once the team identified a common trait or theme, a common level and set of words for stating it were

continuously fed back until common meanings for key terms were established in the minds of all of the web participants.

Another major issue dealt with competitors within the web. Once the assessment team focused on competencies, becoming a neutral trusted partner to web participants, it was able to see and compare the competencies of companies thought to be competitors. The team found that web members were, in fact, serving different markets with different capabilities and strategies. Disseminating this information among web members caused them to see the web and the partners from a different perspective and a more open attitude to sharing information emerged.

2.3.2-Emphasis on Binding Factors

The second criteria implicit in many of the team decisions was its emphasis on binding factors -- that is, the things that are used to build partnerships and good group relationships. Questions were targeted at areas such as culture, ethics and other practices in which binding factors are critical.

The treatment of incompetencies, rigidities and differences in stages of development in some business concepts were also areas where this criteria was applied. Although needed improvements in some competencies were evident in a few cases, we reported only those that were considered essential for a good web operation. Even in those cases these issues were addressed in such a way as to protect the relationships among web participants and the web while promoting effective action.

The assessment criteria do not state that differences or similarities are either all good or all bad. They only state that each similarity or difference among web members should be analyzed for its potential

contribution to the goal of creating incentives for cooperation. Sometimes similarities should not be emphasized if they cannot be considered a binding factor. Sometimes they should be acknowledged openly and emphasized from a different perspective. As an example, duplicated capabilities can be considered as back-up in web projects instead of a competitive possibility, as they might ordinarily be seen. Of course all participants know that some web companies are competitors and that it is normally expected that they will use these capabilities to compete in their present markets, but for those joint opportunities in the web, doubled capabilities allow participants to minimize response time or add variety in the products.

2.3.3-Facilitated Sharing of Common Values and Ethics.

The third criterion during the assessment execution was to facilitate the expression of primary values and ethics. It is known that such behavior elicits responses that help to create an environment of trust and cooperation. Therefore, whenever possible such sharing was facilitated and promoted. For example, some companies did not use explicit ethics statements. Awareness of their implicit values and ethics as well as the extent to which such statements are shared by peers and partners facilitates group identity.

It is important to realize that good ethical behavior can be entirely different for two persons, even two from the same culture. Subtly or blatantly different interpretations of complex situations sometimes raise suspicions, and if a person's or a company's behavior is seen as unethical, the trust-building process is damaged. In other words, to facilitate sharing of common values and ethics means not only to agree on ethics statements, but also to exchange

interpretations about dubious behaviors in specific contexts.

Whenever doubtful situations arose, the assessment team used the web participants' own examples of the right behaviors needed to be embraced by all web participants. These discussions and actions helped to create a sense of identity and trust essential to cooperation.

Promoting ethical and value statements, acknowledging the existence of different behaviors without consciously willing to breach an ethic agreement, and illustrating how to deal with these differences were all areas in which the third criteria was applied.

2.3.4. Process More Important Than the Report

Concurrently with this assessment, Ben Franklin staff was conducting several other activities within the Agile web project. The fourth execution criteria was an important principle: helping the whole process of coalescing the agile web was far more important than the sole publication of the written report.

The team understood that it needed to be involved in the process rather than being only an outside observer, impartial and insensitive to the outcome. Its role was to carry out the assessment in a way that supported Ben Franklin's efforts. The written report and associated documents, although very important from the application standpoint, were really considered a derivative of the main outcome of the process. Whenever in conflict, decisions were made to favor the process, not the rigor of activities related to the academic quality of a publication. For instance, recording of interviews, while recommended in qualitative research, was considered here as an potential inhibitor for open discussions

during the interviews. Therefore, note taking was preferred.

3.0 Methodology

The assessment used experimental techniques within the domain of qualitative assessments because capturing the rich detail which reveals the root causes of behavior and building a cohesive picture of the paradigm by which each organization is run were the desired results. However, minor deviations from what is recommended in rigor were adopted to privilege the process in ways that were assumed to increase the probability of success.

A brief description of the techniques used and references to their formal descriptions are presented below.

3.1-Data collection

Data was gathered from several sources. The primary source was through structured interviews of CEOs and high-level executives. Some data was also collected from brochures, plant tours and occasional telephone calls to review or clarify some of the responses.

3.1.1-Questionnaire

The development of a questionnaire specific for the study was one of the key tasks performed prior to the interviews. The questions were chosen to target areas in which commonalities or critical differences should be assessed as well as those in which self-awareness was needed. For example, some specific areas of assessment were ethics, values, fears, expectations, core competencies concepts, goal linkages to measures and rewards, and hidden value services, among others.

Questions were also intended to assess the participant's level of awareness of the important role in the modern business world

of such concepts as information, customer value creation, trust, business culture, systems thinking and so on. The questions were piloted in the first three companies. After the several editions the group settled on the questionnaire presented in table 1 which was then delivered to all companies interviewed.

3.1.2-Structured Interviews

Two sets of interviews per company were planned and executed. The CEO of each participating company was interviewed and was invited to bring senior executives. To assure capture of a common view, interviews were planned and carried out in groups where all participants were invited to give their own perceptions. Thus, in the initial set we interviewed about 35 individuals in the 20 interviews for the 20 companies. Those interviewed included 10 owner-executives, 20 CEOs and 15 high-level executives.

Interviews were conducted face-to-face and were structured to begin with a review of the purpose of the interview followed by general comments about the participants and their role in the company and the interview. The team used these preliminary sessions to disseminate valuable findings among participants. These sessions lasted anywhere from 15 to 30 minutes and were used as the introduction to a pre-designed set of open questions that comprised the remainder of the interviews. Throughout the data collection, we sometimes had the opportunity to have officials from BFTC who also contributed with ideas and observations after the visit. On average these interviews lasted about 4 hours with a 10-15 minute break.

3.1.3-Note Taking

Note taking was the preferred method of data recording. Although tape recording

could have been used and indeed is the orthodox procedure, it might have introduced some discomfort to the interviewees. Therefore, the team decided to just collect and compare notes to reach a satisfactory recollection of company answers. All three members of the team took notes and then compared them to identify valuable additions or complementary observations.

3.1.4-Additional Documents

Additional documents used in the assessment were marketing brochures and occasionally internal documents provided for the purpose, such as equipment lists, values statements, and brochures.

3.1.5-Company Tours

The first set of interviews were preceded by the CEO's company presentation and a facilities tour during which interaction with his or her employees was also observed as a source of complementary information for the assessments. These plant tours were very important because they provided an overall impression of the company status and its development stage with reference to some of the issues addressed later by the questionnaire.

3.2-Data Analysis

The method described below permitted multiple views and multiple elaborations of the data.

Table 1
Questionnaire

1. What are the strategic services you provide?
2. What resources in your company allow these services to happen?
3. What do you do just to stay in business?
4. If you sold the business what would you want to get paid for?
5. What are your primary skills?
6. What special resources do you have?
7. What system-wide resources do you have?
8. What information resources do you have?
9. What project management skills do you have?
10. What is the role of teams in your company?
11. To what level are your employees empowered?
12. Do you have a TQM program and process in place and operational?
13. How do you pay your employees, by title or by skill?
14. Do you have any special rewards for your employees?
15. Describe the culture of your company?
16. How do you partner? (What type of partner are you to whom?)
17. What are the ethics of your company?
18. How open are you in the sharing of information with your employees?
19. What brings your customers back?
20. How do you measure yourselves and your company?
21. What are your top 3 core competencies?
22. What do you do but not sell?
23. What do you have but no longer need?
24. What do you wish you got paid for but do not?
25. What capabilities do you wish you had but do not?
26. What do you expect to get from the web?
27. What is your worst fear about your participation in the web?
28. Would you share your company's individual answers with web participants?
29. Would you participate in an inter-company mentoring program?

Competencies can be viewed not only as technological and non-technological, as they are commonly classified, but also in classification system that we have adopted.

3.2.1-Coding

The approach to information treatment was to map the answers into 4 categories: the Value System, the Managerial System, the Technical System and the Skills and Knowledge System. The team arrived at these four categories as follows.

First, it was useful to break all data into phrase categories in order to develop common bases for assessment. The team duplicated these phrases whenever assigning the data to one category was inevitable because the phrase referred to a combined competency. Sets of 2051 phrases formed the initial knowledge base. The resulting phrases from the analysis were coded using an approach similar to constant comparative analysis (5) in which each phrase or concept was assigned to an emergent open coding scheme. Then the team jointly produced 339 sub-categories and subsequently reduced these into increasingly higher order levels of 56, 14 and 4 sub-categories respectively. The latter four were the Value, Managerial, Skills and Technical Systems mentioned above.

The team then undertook the task of synthesizing assessment sentences for each sub-category of interview data. Each assessment sentence is based not only on the recorded answers to the open questions, but also on the overall understanding the assessment team had of the status of each collective issue.

By completing this process, a systemic diagram -- the result of a synthesis of the information -- was built. Such a diagram allowed the team to focus on each domain of the core competencies of the web and to

trace each assessment statement to the individual company concepts that built it.

3.2.2-Knowledge Base Development

The set of 2051 phrases, 339 sub-categories, 29 questions and other related information were used to build a knowledge base of the competencies of the web. The characteristics of equipment and a list of manufacturing processes were further detailed. The knowledge base was then fed into an electronic database software package that was common among web participants. Documentation on how to use its search capabilities was provided to web's management.

The team presented the web members with an initial "enabling mechanism" so participants were able to look for specific capabilities among the membership. They could also keep the data base up-to-date as capabilities evolved. These services were provided as part of the technical report.

The knowledge base was designed to provide flexibility for latter improvements and modifications since the team expected that changes in the constituents will cause changes in the web's core competencies. The knowledge base use in the web's internal network and ways to improve it and keep it up to date were also suggested.

3.3-Validity

The process involved internal as well as external checks on the validity of the data and categories. As data was being collected, the team compared notes and developed common observations. Group meetings were held to discuss the interpretation of the data as well as the different categories that were emerging. Also the data and the resulting coding scheme in crude form were disclosed at various stages to BFTC officials. Whenever data or subcategories were not agreed upon additional data was

obtained through additional interviews, phone calls or other sources.

Since the ultimate validity test is performed by the participants on the data itself, a second round of interviews was conducted in which the categories, assessment statements, and the collected data for each company was presented for verification.

We reported only data that participants were willing to have made public, and therefore was uniformly accepted by participants. During the process we changed several sub-categories, merged some, separated others and made necessary changes until a final consensus was reached. A great deal of effort was placed not only in using proper words, but also on conveying exact descriptions of web capabilities.

4.0 Results And Discussion

The assessment process yielded three types of results. The first result was the contribution to the actual change in people's ideas, allowing an easier process of relationship building around the purpose of the Web. The second result was the documents that enabled further applications of the gathered data. The third result was the set of lessons learned about the process itself: assessing the core competencies during the formation stage of the Agile Web. This paper reports the lessons learned in all three sets of results. The following is a recollection of the lessons learned.

4.1.-Lesson 1: The Nature, Structure, and Assessment Process of the Competencies in an Agile Web.

4.1.1. The Nature of Core Competencies

There was a wide variety of interpretations of the nature of core competencies as illustrated in table 2 by the answers given to the question: "What are your core competencies?"

Such variety, also found in the business literature, posed the challenge of how to group apparently dissimilar competencies in nature and/or statement. Although several methods for classifying competencies do exist, the assessing team started by locating the competencies of organizations in one specific subsystem or a combination among the subsystems described below.

The Skills and Knowledge System: the set of skills and knowledge sets embodied in the company's people, in their scientific understanding and mastery of company techniques. It comprises personnel skills and what they know, their capabilities of dealing with single or combined relationships among people, concepts, equipment, products, and processes.

The Technical Systems: the tangible result from years of accumulating and codifying knowledge and information. Examples include information residing in data bases, procedures and design rules, specially designed capital equipment, testing models, and simulation models. To be an organization's competency, this information must be accessible when needed.

The Managerial Systems: the collection of ways a company is "run", and the formal and informal ways of creating and controlling all processes and interactions inside and outside the organization. It is not only the way the company manages knowledge but also the way it manages all other assets. The managerial system deals with the ways a company manages the growth and maintenance of up-to-date relevant assets.

The Organization's Value System: the system which controls the Skills and Knowledge System, Technical Systems, and the Managerial System. It includes the company's culture and reputation.

This is the unique heritage of an organization that is built up over time and is recognized by others outside the organization as well.

These four categories are depicted in Figure 1.

To completely tackle the challenge of finding the core competencies of the Agile Web, an organization in the process of being formed, the team assessed the "higher order roots" of the participant's competencies in

order to assemble the common combination.

4.1.2. The Structure of Competencies

The team defined and used several levels of competencies. The assessment process and data suggested that competencies in an organization can be drawn as a structure having several levels and several types of competencies. Some competencies are aggregates of knowledge sets, and/or skills, and/or assets, and/or cultural elements, expressed in any of the above cited

Table 2
Stated Core Competencies of Agile Web's Participating Companies

Stated Competencies	Probable Nature
Easy to work with	attitude. People.
We are "not afraid to try something"	attitude. People.
Commitment to service and quality	attitude. People.
Service	capability. attitude.
Skills of our people	skills. People.
Our people's work ethic	ethics
Tool & die people	skills.
Customer attention	attitude. skill.
Good knowledge of customers needs	knowledge
Commitment to do what customer needs	attitude
We meet our customer's needs	skill.
Doing whatever it takes to keep customers happy	attitude.
Solving customer problems	skill.
We are a "reliable commodity" to customers	assets.
Technology application to satisfy our customers' needs	skill. Attitude. knowledge.
Delivery on time	skill. assets. knowledge.
Fast in putting new die cast design technology in place	skill.
Use of new technologies	knowledge.
High volume production	assets. knowledge.
Wide based resource capability	assets. knowledge.
Vertical integration with custom electronics manufacturing	assets.
Size and capacity—We can handle large jobs	knowledge. skills. assets.
Value engineering	knowledge. skills.
Design engineering	knowledge. skills.
Control and software engineering	knowledge. skills.
Tool and die engineering	knowledge. skills.
Engineering design software and firmware	knowledge. skills.
Quality and reliability systems engineering with in house test equipment	knowledge. skills. assets
Design of sheet metal systems that they build	knowledge. skills.
Customization	knowledge. skills.
Project management	knowledge. skills.
Machining expertise	knowledge. skills.

categories. Thus any value-added capability performed at competitive level in a given market is usually considered a competency. Competencies describing a commonly understood skill, knowledge set or asset such as "metallurgical knowledge" or "process management" might be considered as the basic level of competencies.

Competencies at these levels can be combined, focused and developed into capabilities yielding higher levels of competencies such as "precision mechanics," or "fine optics," which fewer companies possess. These higher levels might be considered "core" relative to the base constituents because the higher levels further differentiate the organization from others also having the same descriptors for their basic competencies and because such differentiation also expands the geographic domain of competitiveness. The structure resembles an onion in which higher order

aggregated competencies are "core" relative to the outer layers.

It was observed, however, that as the level of aggregation increased, the ability to blend "tangible" (i.e. assets) and low level intangible" (i.e. knowledge sets or skills) competencies harmoniously tended to describe other types of competencies -- competencies that were key drivers of the whole aggregation process. Such competencies are mostly intangible in nature and specifically derived from entrepreneurial ability: for example, the ability to synchronize value creation to huge and profitable market opportunities; the ability to synthesize resource coordination systems; the deftness to quickly translate high order concepts into simple actions. These core competencies are the outcomes of the web leadership's abilities rooted in their beliefs, values, and ethics. But they can only be made actionable by a set of compatible and

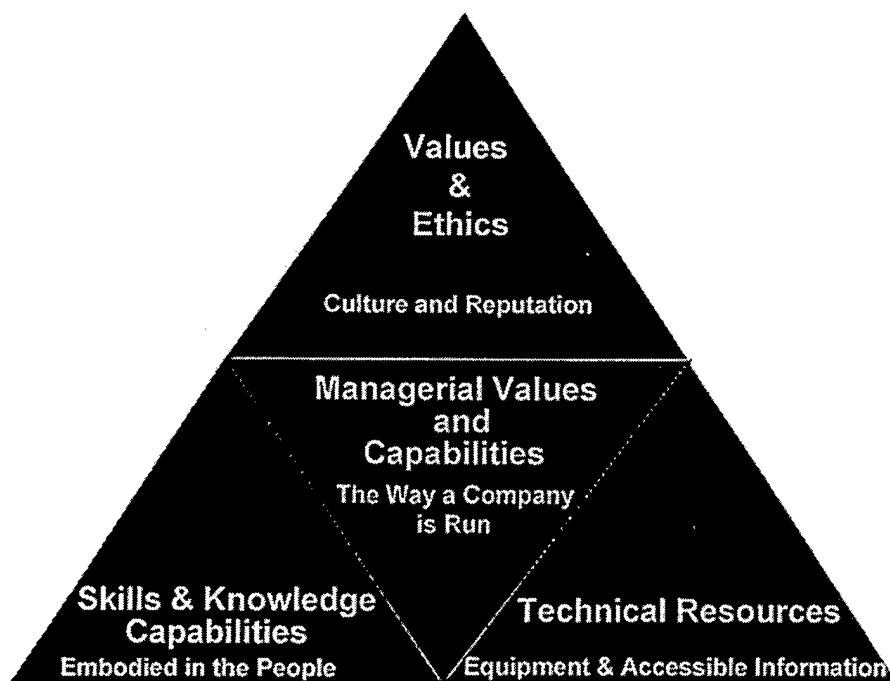


Figure 1. The core competencies classification categories

coordinated behaviors consistently adopted and excelled at by key participants in the organization.

During our search it became more and more evident that the type of core competencies we dealt with in the Agile Web case were of this latter type. They were outcomes of subtle combinations of abilities that allowed a group of individuals to act in concert to create business value. Such abilities enable the group to jointly elaborate the core competencies of the organization -- that is, the right combination of specific strategies, knowledge sets, and skills to create value in each context in which it operates.

The type of core competencies the team referred to at the Agile Web level are outcomes of the collective ability to perceive and create value in a given context, the collective belief about what that value is, about how to make winning transactions, how to creatively harmonize the needs and resources in each transaction, and how to stay in sync when those needs and resources change. Many of these type of core competencies deal not only with technology or resources but with more "soft" issues embedded deeply in beliefs and emotions that show up in values, ethics, attitudes and behaviors.

Since the Agile Web during its formation stage was gathering successful companies led by entrepreneurial individuals, its core competencies belonged to the domain of "group entrepreneurial effectiveness:" that is, the ability of entrepreneurs to properly function in collaborative concert (an oxymoron according to the traditional stereotypes of entrepreneurs).

The team concluded from studying the answers given to the questions that the root elements of these type of core competencies were all in the value system.

Thus the team acknowledged that there were basic competencies, aggregates of basic competencies, and blends or "harmonized sets" of basic competencies. The team used the generic term "competencies" to describe all basic and combined competencies.

Among the latter there were core competencies of several types. The term "core competencies" was used generically, meaning all high level competencies and including those that are harmonized or blended competencies. But the team reserved the term "actionable core competencies" for the specific outcomes which arise from the intangible abilities illustrated in the above paragraphs--synchronizing value creation to huge and profitable markets, synthesizing resource coordination systems, and so on. These actionable core competencies take shape and substance from the combination of entrepreneurial visions in the web. Actionable core competencies differentiate themselves by the fact that they do exist even though there are not previous products, assets, or technical capabilities in an embryonic organization.

4.1.3. The Process Used to Determine the Core Competencies

Assessing the core competencies of an embryonic agile web according to the adopted approach means assessing several shared domains, or sets of "understandings." For instance, the team asked how intense and how shared the collective commitment to the project was. It also considered how strong, how compatible and how deeply shared was the agreement among participants about the set of behaviors they would be willing to abide by in the new organization. In addition, it evaluated how plausible were the ways web participants envisioned creating and adding value in their competitive environment.

Such assessments were not by any means an easy and straightforward processes. Each of them was a search for common perceptions of business realities coming together to form a convincing view of operations and common benefits. Such a view was only achievable by acknowledging, respecting and building the strength of the new organization from the diversity of perceptions, capabilities, resources and opportunities available to the group.

But the process cannot really be described in prescriptive terms of time and steps since it deals primarily with personal transactions. It should be kept in mind that certainly during the Agile Web formation some degree of internal change occurred: decision rules deeply rooted in past business paradigms were challenged. Therefore the rate of progress and success building was dependent upon the rate at which those processes advanced in people's minds, both individually and collectively.

The extent to which the participating leaders see business as a network of personal relationships became perhaps the most important foundation and critical success factor in the assessment process.

The stated core competencies at the end of the process was a distinctive and unique set of business core values for the Agile Web. This set is a "living set of shared understandings" that might evolve as the people in the group evolve or as companies leave or join the web. Its strength comes not from a legally binding contract, but from profound convictions in the leadership that it is the thing they are "naturally" committed to do.

The leadership's determination to pursue a common purpose is the second most fundamental success factor in the assessment process. The team observed that market opportunities do spur enthusiasm to form a

virtual organization but do not necessarily make it successful. However, a knowledgeable and determined group of entrepreneurs will be able to identify or create the market opportunities for their own common purpose. That observation made the team concentrate its efforts on the CEOs and owners of the participant companies and not in other stakeholders of the future web, which should be given proper attention once the common purpose has been established.

Ideally both should come together simultaneously, but it is reasonable that if the opportunity comes first the already identified difficulties will give the new organization few chances of success if the common purpose is not established faster than the opportunity window. This rationale also made the team go to great lengths to protect and contribute to the trust-building process (no recordings, giving utmost importance to proper wording, recognizable format, agreed-upon edition of the final report, report circulation, emphasis on binding factors etc.). The rationale also puts in perspective the role of the present individual capabilities of each participant of the agile web. They will keep being the foundation for their competitiveness as a single entity.

An additional observation deals with the role of present competencies in determining Agile Web operations. The assessing team interpreted them as a bridge and not as a road to the future. The competencies companies have now or had in the past cannot accurately forecast the future, even if that is the most logical and reliable way of building confidence about its future achievements. It is their level of commitment, willingness and determination, that will make the web succeed. All existing knowledge and skills, technical and managerial systems now in place are

evidence of what they achieved when they were committed to their individual purpose in the past. They should not be misconstrued as the certain sign posts to the future.

4.1.4. The Statement of Core Competencies

There is great difficulty in capturing in words the final set of core competencies of the Agile Web, and in relating those words to the full meaning over which the participants agreed. It was observed that once they have agreed in real life, the written words, although important, are not the most important part of the agreement. Any core competency of this type is a rich construct of ideas that cannot be fully expressed in one or two sentences. Sentences are used to evoke the full meaning and to offer a snapshot of the core competencies to outsiders.

In the Agile Web case the core competencies of the explored type are as follows:

- 1) A commitment to web success through customer success.
- 2) A holistic view of the value chain across partners and time.
- 3) A shared value of lot sizes in any quantity.
- 4) A shared belief in the value-added potential of its human capital.
- 5) Value creation through innovative design and leading edge technology used in areas where high ethics and fairness are key issues.
- 6) An open mind to opportunity across conventional barriers of industries.

For instance statement number two could also be phrased "acknowledging the people-to-people nature of business" (meaning exactly the same core competency). Only when the people-to-people nature of business is acknowledged can companies

care for and about relationships. This principle defines the need to be trustworthy and to conduct business with fairness and high ethics now and in the future, and to commit to go beyond the written word in the service to customers. Web members understand that they form part of a value chain in which all partners need to make profits to keep active and to keep themselves available to new opportunities for the creation of new value chains. It is this core value that will determine the type of managerial practices, the type of skills that need to be in the organization, the type and configuration of the technical resources that should be in place and the risk and reward policies that should form the basis of the compensation plans.

A similar deployment can be done for each of the above competencies. What is important is that the CEO group can look at them and relate them to the commitment and purpose that was built during the process.

We learned also that these type of competencies were present in variable grades in each participant. However these competencies can be reinforced or obscured by several factors such as communications and personality traits during the relationship building process of Agile Web formation.

Core competencies of this type are outcomes of a shared set of business core values. These values instill in the leadership a common goal, and along with the goal show how to create value in a continued way. Most notably, due to their intangible nature, it is difficult to articulate them in a simple set of words. Rather than a set of statements they are a set of "Shared Understandings" about the "what," "why," and "how," to function in the new entity. They nurture the determination or commitment to create value for customers.

All other competencies needed for web activities are derived from the core. Specific derived competencies or combinations of them might change as needed to create value in sync with the market place.

4.2.-Lesson 2: The Different Locus of Competencies in Agile Webs.

There are four distinct loci of competencies in Agile Web: competencies of the individual participant firms; the combination of the collection of competencies of the individual firms; the competencies of the web as a whole entity, and the competencies of each virtual organization formed to seize a market opportunity.

These four loci are illustrated in figure 2. The first locus describes individual company competencies. The second locus presents the view that a person who is supposedly considering buying all 20 companies might want. He/she would be interested not only

in the individual competencies within any company but in the possible combinations and blends of all of them. Thus while looking for example, at equipment, he/she would like to know the range and characteristics of the whole collection of equipment existing in the 20 companies. The same is true for managerial techniques and information infrastructure, etc. The third locus deals with competencies of the web as a whole entity and refers to such competencies as the speed at which virtual organizations are formed, or the rate at which quotations are obtained, etc. Finally, the fourth locus is each virtual organization that is formed as a customer opportunity team, in which competencies dealing with specific value creation for the customer are included, such as the ability to interact seamlessly or to tap into each organization's resources, etc.

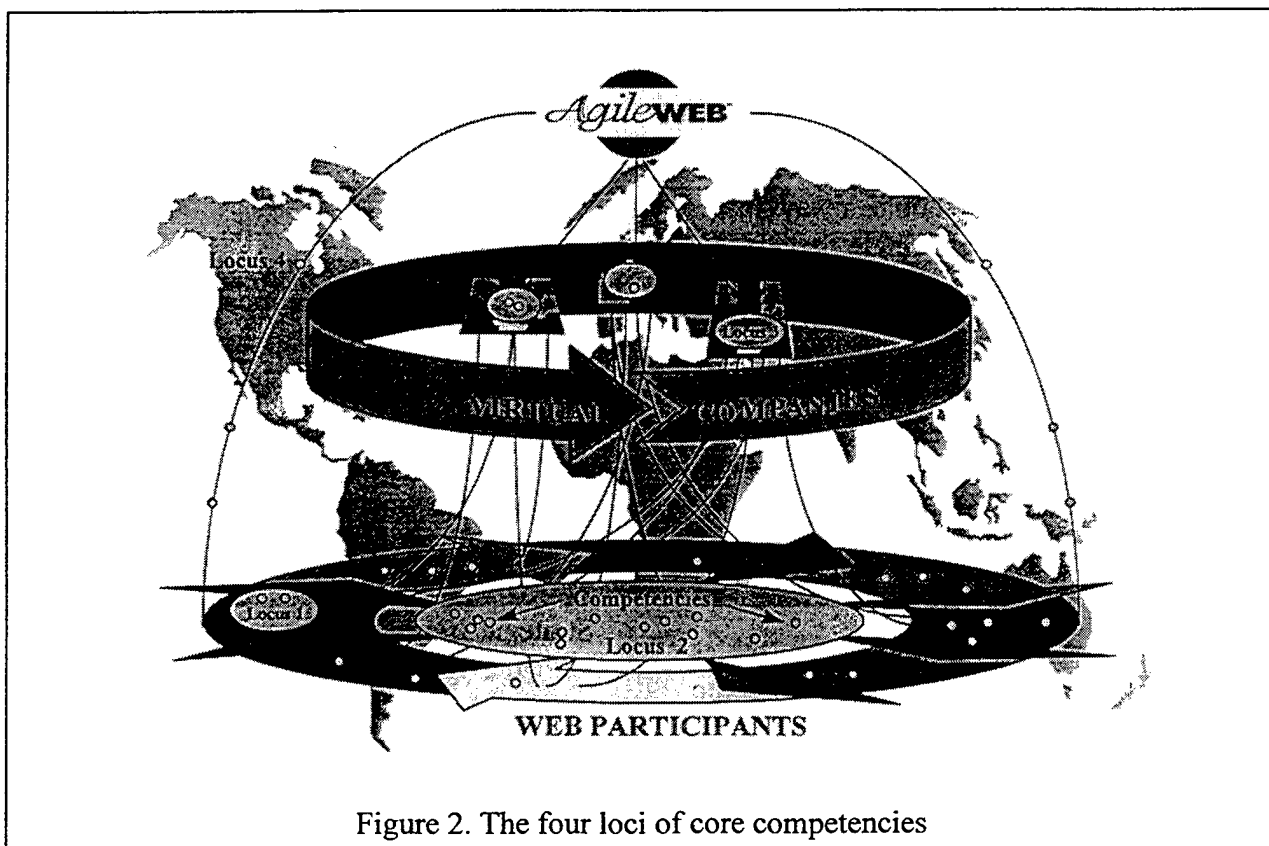


Figure 2. The four loci of core competencies

The set of competencies for the Agile Web is different from those of each virtual organization it nurtures. However, they are different only in that those of each virtual organization is a particular case with specific traits unique to that virtual organization. For instance the way to create value in a particular case is determined by customer's needs, priorities, barriers, resources and specific goals of the virtual organization within the web scope of competencies.

Individual participant companies have core competencies that are unique and are not necessarily a particular case of those in the Agile Web. The way they create value in fact differs from the way the Agile Web does. This is not only natural, but the way it should be; otherwise conflict could appear between the participant and the agile web regarding allocation of opportunities. In such a case the participant is a competitor of the agile web and not a complement of the individual companies participating in the web.

Technical competencies might be similar or even identical for the web and one of its participants. The web should always have more capabilities than any single participant. These are examples of other observations regarding the domain of competencies, capabilities and core competencies along the four loci described above. The four loci of competencies are sources of competitive advantages for the web, each having different potential impact.

4.3.-Lesson 3: Tactical and Strategic Use of Collected Information

The competencies, values, and ethics assessment during agile web formation yielded data that was elaborated into a knowledge base for both tactical and strategic uses. Tactical uses were easy to find; however, interpreting and using the

data to derive strategic benefits is a much harder process. Practice of detailed agility principles in the process itself is important for maximizing the benefits of the web competencies.

Some companies with good communication and open attitudes started to take advantage of tactical uses. In this case the team observed that the initial trend was to use the data for tactical purposes and then slowly the focus shifted toward the much harder process of using the data for strategic purposes.

Referrals to new business opportunities for the individual firms, and increased business among participants, are considered examples of tactical uses that occurred during the web formation. New business development through the creative combination of their capabilities, or building web competitive advantages through the existing knowledge of business services are examples of the strategic uses that were attempted later.

We can separate tactical uses from strategic uses on several accounts. More business as usual is bound to be a tactical use of the data and the web. More business with improved profitability by at least an order of magnitude could be considered as a type of strategic use. Better positioning in the market for survival during economic downturns is another strategic issue.

Learning how to use the new business practices, how to identify core competencies and how to increase the knowledge and value of their human capital are strategic generic uses of the data.

Strategic issues observed by the team dealt with the type and size of the projects, the type and qualification of customers, the competencies needed, and so on. For example, the data can be used to know competencies available to respond to

opportunities without resources external to the web. Small projects with few participants might help the participants to gain experience with the new business practices and make them rapidly aware of the issues and solutions to the collaboration venture. However projects with many participants might originate simultaneous interest and commitment among many members to advance quickly in strengthening infrastructure and relationships. An strategic issue is to what extent, when and where to use each type of project.

During the assessment process there was a great deal of activity about the way the data could be used for establishing a marketing plan. Positioning, markets to be served, sales channels and product offerings are all issues that the data supports. All these issues can be defined any place along the continuum, from a rather "conventional" approach to a more radical agility approach.

The data was thus used to give input to the marketing team that was almost concurrently developing a proposal for web positioning and for a business plan development team. Their involvement was a two-way job since their review was also a valuable input to the assessment.

These interactions suggested improvements, such as database sharing over the Internet, that would allow the whole process to take place more quickly. The team also believed that face-to-face interviews should be kept but effort should be made in logistics to use electronic communications to reduce the publication time while increasing interactivity of participants with the final document.

Agility knowledge is important here to clarify a strategic approach that yields the most benefit. If agility knowledge is not used, a web that supports virtual

organizations can still be formed but probably not with the agility traits that makes it a global competitor.

4.4.-Lesson 4: The First and Most Critical Success Factor: the Belief in Business as Relationships between People.

Many success factors emphasize the importance of people in the process of successfully building an strategic alliance. In an agile web this factor is stretched out even more to allow for rapid deployment of solutions. Webs might create value in many ways. However, agile webs increase that value by using fast deployment of knowledge-based processes only achievable by highly interactive personal relationships supported by information technology. Community in seeing business as a network of relationships instead of a collection of activities or arms-length transactions over physical products, is key in the partnering process toward agile organizations.

The team learned that this critical success factor for web operations is also true for the core competency assessment process in virtual organizations such as agile webs. The whole process must place a high value on relationships, not only to avoid disturbing the process but also to help the process succeed.

Valuing personal relationships took many forms during the study, and in ways that made sharing of data and talking openly about perceptions easy for the participants. We found that even small criticisms might endanger relationships and that there were better ways to cause people engaged in a relationship-building process to realize the changes in perceptions. One better way is to encourage people to discover through a peer mentoring process the advantages achieved by other participants in a way that can be beneficial to all.

Seeing business as a network of core relationships is a different mindset that allows people to make decisions in which they deal appropriately with such intangible assets as well as with other aspects of the decision. Seeing business as a network of relationships between people, forces decision-makers to consider first the impact of any action in the revenue generating relationship over the long run. This does not mean that making profits takes a second place to intangible assets. It means that a satisfactory relationship allows everyone to make profits on a continued basis in the future, and that what is important is the business relationship and not individual transactions.

Thus, seeing the web as a network of relationships between people helps the assessment team to keep focused on the proper actions to preserve the quality and strength of those relationships during the assessment execution. Items such as confidentiality, sensitive issues, and the sense that there are fluid perceptions help the group to understand situations and relationships in a way that is positive to the outcome.

It was observed that explaining agility-derived opportunities within each company context was an effective way to build credibility into the value of the project.

Such a trait is important also to build rapport quickly and establish a candid conversation that releases anecdotal evidence of the real status of a company regarding its values, culture, practices etc., and not only a "marketing" set of answers.

4.5.-Lesson 5: Special Judgment Should be Exercised During the Core Competencies Assessment Process.

During the assessment execution the team became aware of the differences in

perceptions about the public impact of any assessment statement about a web competency. The assessment team learned that extensive use of interactive communications, appropriate ways for suggesting improvements, proper use of words and recognizable formats in all documents, activities and interactions need to be handled carefully to overcome fears of vulnerability, build trust and deal with personality traits. The team focused on finding and using alternatives that increased the level of participants' commitment to the web and that brought the business leaders' relationships into alignment with the common purpose.

The proper use of words was by far the most notable issue during the study. Meanings behind simple pairs of words such as *customers* vs. *clients*, *employees* vs. *associates*, *members* vs. *participants* (not to mention complete sentences that evoked different levels of commitment in different people), were issues that illustrated to the team the importance of wording in building consensus.

Another example was the decision to keep the format of the initial document in the final report as a means for the participants to recognize and build ownership of the final report. Even though several ways to improve the document between data collection and data validation were considered by the assessing team, those improvements were not introduced in the final document to eliminate possibilities of presenting the results in forms that the participants could not relate to in a familiar way.

This special judgment is a skill that can be easily described but difficult to deploy in practice. It is akin to facilitator's "common sense" skills; however, a great deal of not-so-common knowledge is required to not

introduce undesired effects during the assessment. For instance, how should the team deal with needed improvements in individual companies without engaging in a personality clash of CEOs? To deal with these and other situations in which common progress can be achieved, routes that preserve group relationships should be sought.

4.6.-Lesson 6: The Assessment Role Within the Web Formation Process.

The process of assessing the core competencies of a group of companies participating in an agile web can contribute effectively to establishing rapport and relationships during the formation phase of the web if it is conceived, executed and reported as a dynamic, interactive, "living" process. In this sense all the activities, including the reports, should be used as enabling mechanisms to a process and not as ends in themselves.

Although more straightforward ways of collecting data can be envisioned, such as standardized formats of closed questions over electronic networks, the synthesis process requires face-to-face interactive interviews to gather in rich detail the subtleties of the shared domain in the collection of views of the nascent entity. Much of this detail is usually lost if there is not at least some amount of initial trust to start the companies in the process of information sharing beyond what is customary in the marketing and news releases.

Thus the study should not be viewed as an information-gathering activity, but rather an information exchange wherein each interview the company provides allows them to gain not only information but also knowledge about the commonalities of the web participants.

The written reports serve mainly to evoke the shared understandings and do not capture all of them. The qualification of a new participant requires also personal interactions with the remaining participants, even though he or she could previously have read the written report and supplied data to be included.

This kind of assessment is different from the usual way assessment studies are done. The assessment itself is based partially in what the participants have and are today, and partially in what they are committed to have and to be in the future. Thus there is an inherent difference in the way most people think about the assessment of a traditional capability and the assessment of these types of core competencies of an organization. This difference does not mean absolutely that the assessment team is "putting ideas" in people's heads or "making wish lists." These two biases should be avoided during the study.

However the assessing team is always probing in all participants acceptable behaviors and goals that somebody within the web, including the assessing team, suggests as a shared domain in any specific topic. The team will learn whether all participants acknowledge such a domain, and if not, it should be discarded. These activities are carried out as enabling mechanisms for the web to find sharable concepts upon which to build the practices, behaviors, skills and all other resources to support such an agreement.

5.0 Conclusion

In summary, the lessons learned during the study constitute the guidelines for a new process to determine special types of core competencies during the formation stage of virtual organizations and agile webs.

The process emphasizes business core values as the intrinsic nature of core competencies. Four areas of applicability of the concept arise in agile webs from which competitive advantages can be derived. Organizations can use this method to become a fast, high value-added partner in the pre-qualification process for any agile web.

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How to Determine the Core Competencies of an Agile Web

By

Devia Napoleon, Nagel Roger N., and Nickel Ted Y.

Abstract

This paper describes an improved version of the recommended "expertise" for executing a competency assessment in a set of companies willing to form an agile web. It is likely in the future that the BFTC or other organizations might want to facilitate other projects to form agile webs. The paper initially defines the meaning associated with terms commonly related to agile web formation and the way they will be used in the assessment. It continues with a description of background information formats, question areas, specific questions, procedures, logistics, and reports. The assessment describes both the competencies of the individual companies and the core competencies of the emerging web. The assessment is described as a process to enable the discovery of the core competencies of a virtual organization or an agile web. The result should be a set of "business core values" shared by the leadership of all participant entities. The resources to be used as well as the a set of guidelines for the activities during such an assessment process are described.

1.0 Introduction

After the first assessment process to determine the core competencies of the Agile Web Inc., several improvements to the original method were acknowledged by the assessment team.

Improvement areas include the formation of better questions and the planning and execution of activities such as dialogs, lectures, interviews, company tours and visits. The team also identified other needed improvements, such as standard support materials to facilitate data collection and the use of electronic methods to treat data. If these changes are adopted, they will probably enrich the collected knowledge while improving the productivity of the assessing team.

In addition, the guidelines used to seek out a set of mutually agreed-upon ethics and competencies that will enable business people to advance as fast as possible toward a common enterprise are presented.

What is presented should not be interpreted or reduced to a conventional hand-out questionnaire or survey in standard form applicable to all companies under all circumstances, or even a customizable form of pre-designed flexibility. It is simply

intended to be an starting point for a customized evaluation.

The specific experience gained in the formation of the Agile Web Inc. of Pennsylvania is used as an example to illustrate the application of the main ideas presented.

2.0 General Description of the Assessment

The proposed assessment process starts with a formal idea exchange and concept clarification stage about the available opportunity, core competencies, agility, purpose and procedure of the assessment, and the intended use of the generated documents. Once the basics are established regarding these activities, the assessment team proceeds to review the background information and prepare a questionnaire for the structured interviews. Then, the team will conduct the interviews, the competency assessment, and the validation process.

The assessing team should design the whole process to help deploy as quickly as possible the set of business core values, ethics and competencies that will enable people to build a common business destiny. This goal is best achieved dynamically if the

assessment is conceived of as a match-making process of perceptions about the new entity, making explicit each constituent's expectations and fears. Together, through assessment, they can review the potential contributions, the behaviors needed, their goals for the new entity, and how they plan to harmonize these behaviors and goals to reach the highest possible level of shared domains and commitment.

During this process the assessing team keeps an alert and open mind, discovering and tracking leads to the competencies while simultaneously guiding the participants to examine common perceptions through appropriate thinking patterns and decision-making rules that allow them to remove the obstacles to the new form of organization.

Assessment activities will yield data about tangible and intangible characteristics of the new entity, which need to be agreed upon through an interactive process. If properly executed the process will yield the commonalities that constitute the values, ethics, and the different types of existing competencies available in the new entity.

Once these commonalities are determined, assessing the core competencies of an emerging agile web means assessing the emerging outcomes in several key areas. For instance, the team might evaluate how clear, intense, coherent, and shared is the vision that the collection of people are committed to in the new entity. The team might also evaluate how large and how compatible is the shared domain of behaviors that the constituents are willing to abide by in the new organization. Another venue of inquiry is how plausible the shared domain is, according to the ways the constituents envision creating value in their competitive environment. The assessment team must find answers in areas such as those described

above through a highly interactive process. The process is a meeting of minds and perceptions about business realities coming together for the common benefit. These benefits are only possible by acknowledging, respecting, and building strength from the diversity of perceptions, capabilities, and resources available to the group.

The assessment process cannot be described in prescriptive terms since it deals primarily with personal transactions. It is almost certain, for instance, that during the process some degree of internal change will occur to the decision-making rules -- rules that are deeply rooted in past business paradigms. Therefore, the rate of progress and success building is dependent upon the rate at which those processes advance in the people's minds, both individually and collectively among the constituents of the new entity.

However, there is a procedural pattern, a set of high-level guidelines, to design and execute the assessment process. It can be used successfully by a team of individuals who are simultaneously facilitating, case by case, a specific path to bring together several organizational units into a single opportunistic virtual organization. It can also be used to gather a collection of organizations so that they can operate in a web fashion. The guidelines provided below were effective in determining the core competencies of the Agile Web.

The first guideline is that in each particular case the specific details of the process are highly dependent on the specific time and circumstances of the organizations involved. The most important factors are the current mindset of the people leading those organizations and the leadership role of the organizing entity. Progress is measured in terms of tangible results as well as intangibles ones, such as the extent of commitment to and satisfaction with the

new web, as well as the growth of the knowledge and core competencies of the group.

Several key issues should be kept in mind during the design and execution of the process.

First and foremost, the leadership of the individual companies and the new entity should use their agility knowledge to apply agility principles to the everyday situations they encounter. This effort should be complemented later by the continuous use of the newly found core competencies of the web to increase its level of awareness and strength as well as keep the group on the fast track to a truly agile web.

A second key issue is to concentrate on increasing the awareness and willingness to couple, build, or complement the capabilities needed to seek and create opportunities in which the derived benefits for the group are greater than the derived benefits of each member acting alone.

The third key issue deals with the assessing team: it should be part of the glue, not a detached element in the process. Otherwise, it might easily become itself another source of obstacles in the integration process. Assessing the core competencies should not be a cold evaluation by an outsider uninterested in the final success of the effort.

It is expected that the stated core competencies at the end of the process will be a distinctive and unique set of business core values for each new agile web. This set will be a dynamic set of agreed-upon understandings that will evolve as the people in the group evolve or as companies leave or join the web. This is not a legally binding contract, nor is it required to be. It should not be misconstrued as a liability contract of some kind, even though constituents might consider at a later date to have some sort of

such document to facilitate doing business with some clients.

The summary process should unlock the resources to deploy the core competencies of the new organization, thus enabling the assessing team to determine them by mapping the shared domain of understandings.

These competencies are then assessed by determining specific characteristics such as those related to the following questions:

1)How clear, intense, coherent and shared is the foundation and the vision of whatever the group is committed to?

2)How will the group behave within the new organization?

3)How will the group add or create value as conceived against the set of trends and driving forces in the competitive environment?

3.0 Specific Task Guidelines

The process of assessing competencies, values and ethics can be seen as the activities in four major stages: 1) background information exchange 2) the interview process 3) data treatment and feedback, and 4) report or results dissemination.

3.1- Background Information

The process of establishing a common background information includes interactive lectures, workshops, and telephone conferences in which the strategic rationale for the new organization, fundamental concepts and information on individual companies are introduced and openly discussed. Agility and agile webs are covered in some detail elsewhere (see *Agile Competitors and Virtual Organizations*, Goldman, Nagel and Preiss, 1994). Besides specific agility topics, the following section

includes definitions that can be used during the initial interactive lectures for clarification. Establishing agreement among the constituents about the fundamental concepts is key to facilitate the information collection process from individual companies. An informed participant will be more willing to share information with a more open and cooperative attitude.

3.1.1.-Definitions

Understanding what type of core competencies are sought is not only the basis for determining them correctly but also the basis for enabling a company to nurture, evolve, manage, share and protect them while simultaneously avoiding the risks and troubles associated with partnerships that are not based on core competencies.

We find it necessary to establish a clear and consistent set of definitions to make core competency concepts more actionable. This observation arises from the variety and sometimes contradictory use of some terms that are related to core competencies in the business literature. (see note 1).

The definitions listed below should not be misconstrued as an attempt to create debate about the true meanings of these words. Since each word has several accepted meanings, such a debate would be futile. They are provided only as a means to share with all participants the specific meaning that is being associated with them in this particular assessment. A short explanation was also added to attempt to further clarify the selected meaning within the context of assessing the core competencies of an organization.

The following terms and associated meanings will be used throughout this paper, and are recommended for future assessments.

Ability: the power to act.

Aptitude: innate or acquired disposition or readiness to perform an action. It is assumed that human beings have the innate disposition to execute some actions, e.g. thinking of ideas. However, they are also prone to achieve the state of readiness to perform more complex actions through acquisition or "learning," such as being apt to assume managerial positions.

Attitude: a disposition to act or behave in a certain manner arising from a feeling or emotion, i.e. customer-orientation. The emphasis or distinctive feature here is the assumption that the disposition to act arises from true feelings or emotions.

Value: ability to elicit strong motivation toward acquisition acts.

Business: The human social activity of producing and exchanging value through goods and services.

Values: intangible objects (feeling, belief, attribute, attitude, quality, or behavior) of convenient desirability as a means to such high and sometimes obvious or implicit purpose that it looks like an end in itself, such as honesty, integrity, hard work.

Ethics: a system of principles or rules of conduct recognized in respect to a group. A set of agreed upon and therefore accepted right behaviors to be practiced by participants of a group.

Knowledge: the accumulated body of facts and concept representations derived from acts.

Skill: the ability to do something well, developed through practice and knowledge. (Skill = aptitude + attitude + knowledge). Any skill can in turn be comprised of several skills, aptitudes and knowledge sets; i.e. the persuasion skill seems to be a combination of good communication, perception, and

empathy skills, plus the ability to generate trust.

Talent : exceptional skill.

Capability: the resulting ability of combining a skill with another resource needed to obtain the outcome. (Capability = skill + instrument). Capabilities usually have boundaries or limits imposed by the skill performance or the instrument performance. The "instrument" does not need to be complex equipment, but it can be. Thus an instrument can be anything -- from a pencil and a sheet of paper to a high-precision automated machine.

Capacity: a capability quantifiable in terms of volume of output. Sometimes it will also be associated to volume rate of output. (capacity = rated capability)

Competency: A capability performed up to an accepted level when compared among performance levels of peers, i.e. within six sigma deviation from the mean output of performers. (Competency = a ranked capability. Comparison and competition implied.)

Core Competency: A competency that generates an essential contribution to the value-generating function of a business. Such competencies are usually blends of several low-level competencies.

Actionable Core Competency: a competency type that generates an essential contribution to a systemic set of business core values shared by a group of people effectively assembled to generate value.

Core competencies of the type defined here are outcomes emerging from the combined deployment of two or more of the entrepreneurial capabilities embedded in individuals, such as the capability to identify and seize opportunities, to adopt appropriate behaviors that nurture business

relationships, to build a correct and shared common destiny, to display and generate a high level of commitment, to exercise a high level of determination, to continuously create value in innovative ways in sync with market needs and opportunities, to creatively organize available resources to synthesize responses to opportunities, and to instill all of the above in as many members of the organization and in as many application areas as possible. Thus, an actionable core competency is a result harmonically synthesized from the pool of available resources by operating appropriate combinations of entrepreneurial abilities over, across and in the group's competitive environment.

3.1.2.-Information From Companies

The information collection process from the individual companies is divided in two parts. It is suggested that the first part be collected by the CEOs before the interview through one or more of his/her senior executives. The second part can only be collected through interviews. This section deals with the first part only -- the background information.

Any company willing to position itself as a partner for a virtual organization or an agile web should have ready a set of factual information about its background to be shared with potential partners.

Just as an "investor package" is prepared to facilitate potential stockholders' investments, so a "partnering package" should be available in printed and electronic form. It is recommended that the information package contain information from the individual company's competency assessment and it should be ready in a format easy for potential partners to evaluate.

At least the following items should be present.

a.-A Business Description. This description should include the following: company name, industrial outcomes, company history and affiliation, parent companies and subsidiaries, year established, any company distinctions, customer base size and sharable examples, the number of employees. SIC codes, classification, international relations and operations, financial information and present revenue status.

b.- Organization Strategic System: vision, mission, goals , objectives and company strategy, as well as culture and value statements (whenever available).

c.- Company Performance Measuring System.

d.- Training System and Policies.

e.- Compensation System.

f.- Facilities Characteristics.

g.- Processes Capabilities and Capacities, based in standard taxonomies. In annex 1 an example of a format for this part is presented for manufacturing processes. Similar tables can be made for managerial processes and for every industry in which specific processes are required.

g1.- Managerial Processes

g2.- Information Processes

g3.- Manufacturing Processes

g3.1.- Mechanical

g3.2.- Electronics

g3.3.- Communications

h.-Quality System.

i.-Data Communication System characteristics.

j.-Competencies Assessment

k.-Contact People and Information, including address, city, state, zip code, contact names, positions and phone numbers, email addresses and URLs.

l.-Other relevant information, including brochures, equipment list, reprints, etc.

We suggest that in order to facilitate a quick evaluation, a standard form of this report or "partnering package" be adopted by all participant companies, which can then also agree to publish and maintain it updated in written and electronic formats over a restricted access site available only by a password protected code to participants.

This background information then constitutes the basis for planning the interviews. Each company might mail its answers to the assessing team to assist them to prepare the interview. A tour of the facilities might be offered if so desired. It is also recommended that the format which has been developed be posted in an Internet Home Page so it can be downloaded quickly by the assessing team or the interested partners. Some companies might not want yet to disclose to the general public its basic capabilities database, arguing that it might give away valuable information to competitors. In such a case we recommend each company show what they are doing now, and not what they are about to do, in order to protect its leadership benefits in introducing progressive changes in the market. Although this stance might seem quite risky, it is believed that as companies shift from competing on equipment and capabilities toward competing on core competencies, this kind of information will become easier to share over public lines and a higher set of ethics will evolve within the business community.

3.2 Interviewing Process Planning and Execution

In planning for the interviews, the following areas should be considered for evaluation by the assessing team:

A.-Leadership "cooperability" and commitment.

B.-Organizational Culture Compatibility.

C.-Strategic Compatibility.

- C1.-Motive Intensity and Type.
C2.-Expectations and Fears.

All participants do not necessarily have the same expectations and fears. Some of course need cash, however, access to distribution channels, brand positioning in a given market, market share etc., are all equally rewarding outcomes and reasons to get into the web. Of course to succeed the new organization needs at least to meet the expectations and eliminate fears up-front.

D.- New Entity Harmonic Synthesis

- D1.-Shared Domain of Common Destiny.
D2.-Value Creation Intent
D3.-Proposed Conditions for Partnership
(individual and shared domain).

The idea will be not to find whether they are able to partner, but under what conditions and/or required changes the proposed partnering is likely to succeed for the types of organization proposed. This effort will facilitate each partner in the evaluation whether it enters the organization or not.

3.2.1.-Questionnaire

A revised version of the questionnaire is provided below as a guideline to conduct the interviews in a structured way. The questionnaire might or might not be given in advance but the interviewing team should proceed to clarify the needed information and collect additional evidence of statements in form of anecdotal or factual information.

Rather than a fixed set of questions, the final

Table 1
Questionnaire for Core Competency Determination

1.- Describe the set of ethics in the new entity that would be most compatible with your company's ethics.
2.- What information do you anticipate should be given and received in the new entity for proper functioning?
3.- What key areas for the success of the new entity would require employee behaviors different from those traditionally followed in your business environment?
4.- Under what circumstances would you rather partner with customers, suppliers and/or competitors, and what would you ask as necessary conditions to do so?
5.- Describe your company's culture, emphasizing the features that are important to consider from your partner's perspective.
6.- What special skills in your company should the new entity rely on or use as a resource of expertise?
7.- In what areas or tasks are teams used frequently in your company?
8.- What brings your customer back?
9.- If you sold the business what would you want to get paid for?
10.-What demands from your customers are challenging your company?
11.-What are the three most effective methods of technology acquisition in your company?
12.-What customer-valued top three unique areas does your company have?
13.-What strategic services do you provide?
14.-What are your top three core competencies?
15.-What do you expect to get from the web?
16.-What are your three worst fears about your participation in the web?
17.-Why would you like the new web to succeed?
18.-Why would you think that the new web will succeed?
19.- What special rewards do you have for employee performance?
20.-Please describe how do you collect, process and use information for strategic purposes.
21.-Please describe what your facilities and equipment use policies are.
22.-Please describe examples of how your company applies your human resource policies at different levels?

questionnaire should be configured after reviewing all background information, and considering the areas described above. If necessary, questions should address information that needs to be clarified from that submitted by each company.

Open-ended questions are strongly recommended and should be tailored to the specific situation at hand. The set of questions in Table 1 is provided not as a fixed questionnaire but as an example that should be modified as appropriate.

3.2.2 Interview execution

The interviews can be carried out at each interviewee workplace to facilitate rapport, as can be the personal review by the assessing team of the company's facilities and environment. The interviews should be planned by geographic location of the participant's facilities. However, different approaches might be necessary depending upon what the assessing team feels appropriate in each case. Grouping by industry type or having each participant come to the same place for the interviews are ways to be considered only if it is necessary to reduce the information collection time. However, the approach of interviewing individual companies by the same team is helpful for the team to gather the common domain.

The persons conducting the interview should be highly regarded by the participant companies' CEOs. For this purpose the team should have at least one member with an outstanding ability to rapidly apply agility knowledge to suggest opportunities so that CEOs can perceive the additional value of being associated with the project. This is also the mechanism to increase each participant's interest in adopting new thinking patterns and decision rules that allow them to remove the obstacles to the new organization as an agile enterprise.

Tape recording, although highly desirable, is optional to the interviewee, and even then should be kept unobtrusive. Good judgment should be exercised whether to even ask for permission to record so as to not bias the interviewee toward withholding valuable information because of fear of later disclosure. In some cases a tape recorder tempts the interviewee to adopt a "marketing" attitude for the company instead allowing him or her to offer a candid view. Even if the interviewee gives his/her acquiescence to recording, high ethics and tact should be exercised: interviewers can commit to the rule that nothing should be published from any recording without prior release agreement.

A three person team is suggested, with different roles during the interviews. The team leader will interact with the CEOs, leading the interview pace and the order in which the questions are asked. A second team member should be collecting anecdotal evidence and specific example data as well as supporting the team with leading or clarifying questions. He should be a "consistency checker" during the interview as well as a good communicator of other web participant's strengths that could be of benefit to the interviewee. A third member should be attentive to group interactions and to help capture group reactions. This member should be a good observer and willing to help with the logistics of the meeting. All three members might ask clarifying questions and take notes independently.

After the interviews, the three set of notes are compared, consolidated and agreed upon by the team, before being turned into raw material for the knowledge base. It is highly recommended that each member submit individual observations in printed and

electronic form to facilitate the subsequent processing of the information.

3.3 Data Analysis Procedure

Almost without exception each answer might offer some information that belongs to or is somehow related to other questions. Hence, breaking the answers into concepts so that they may be analyzed and organized for the process of synthesizing the assessment is vital.

For example, answers about resources might appear in several places. Breaking the sentences into concepts is a key step. The point here is not to lose meaning in the process, and not to be afraid of repeating a clause or copying long clauses if necessary. Use of the same words, as stated above, should be strictly adhered to since the participants should be able to recognize their answers at a later date in the report and during validation. Wording is important and should be highly flexible. Expect many changes, lots of interaction, and much clarification of meaning.

Each concept from the answer is then placed in a knowledge base in which the concept is coded and related to all other data such as the company interview date, the person that stated the concept, and so on. In that way, if necessary, each assessment to be construed can be traced back to its original foundations by any interested party.

The next step is to gather the concepts by clusters of topics suggested by their own nature, called sub-categories in this assessment. Sub-categories should develop according to the key issues that the participant leaders judge important based on the interviews. Sometimes all answers to a question can be grouped within the same sub-category, but that route is not always possible. Sometimes additional comments address an important topic that should be

assessed in other participants, in which case it is necessary to complement answers from companies already interviewed. After all the sub-categories are identified, the assessment should state clearly whatever can be stated about the collection of competencies within a given sub-category.

There are different ways to start grouping these concepts into sub-categories, to name sub-categories clearly, and to state the assessment of each sub-category. The key to do this task effectively is a shared understanding within the team about what core competencies are and/or a willingness to quickly consider, evaluate, and synthesize different alternatives if possible. Different conceptual understandings of the nature of core competencies within the assessing team might lead to different results and confusion if clear leadership is not in place. Clear leadership and a clear understanding allows the assessing team and the participants to differentiate what is essential from what is not and what is a competency from what is an emerging capability.

The sub-categories are then grouped into higher order sub-categories and categories until the basic dimensions of the values, managerial, technical, and knowledge and skill systems are reached. This assessment method allows the mapping of the competencies using whatever competencies' dimensions are preferred by the participant's group. However, the core competencies emanating from any dimensioning approach should be the same regardless of the mapping procedure. This end-result check is probably a validation test as to whether the stated competencies are truly essential and actionable.

3.4 Results and Validation Procedures

Once the assessing team has arrived at initial results, they should be shared and discussed with the participants individually to allow

them to review their answers, shape them in ways to better convey their intended meaning, and give feedback on the sub-categories and assessment statements. The second round of visits were useful because many key areas emerged at companies that were interviewed last, and there was a need to gather additional information in those areas. Hopefully the present method will systematically gather those areas, but two rounds of visits are strongly recommended. An improvement to the procedure would be to use video-conferencing and whiteboarding technologies to increase participation and speed of feedback response during this validation step after the second visit or between visits.

After the individual validation step is done the whole document is delivered to the group. An improvement on this method might be to present the results to the whole group with suggestions about uses and special findings from the assessing team.

Dissemination of the results to other groups such as marketing, operations etc., should be continuous and concurrent with the development of the knowledge base. However such dissemination need to be taken as susceptible to major changes at least until the final official report is released.

Improvements regarding report generation can be made by providing more flexibility for changes in capabilities and assessments as companies join and leave the web. Rather than a static set of competencies, the challenge is to keep the competencies set updated. An electronic format is thought to be the convenient way to do this over a network server. There is a need, though, for changes in the assessments as competencies change. Therefore the competency assessment of the web needs to be done in sync with changes in company profiles or in company participants.

The format recommended in this report is amenable to an electronic format so that assessments can be made as quickly as the changes occur. It is suggested that companies be responsible for updating their competencies in their individual home pages or common report, but that the assessment should be a permanent function of a designated person at the web leadership level.

4.0 Relevant and Related Issues

During the assessment process a set of issues will arise that needs to be resolved among the group. Our perception of such issues and the way they were resolved in the assessment of the Agile Web Inc. of Pennsylvania is presented below.

The leadership's determination to pursue a common purpose is the most fundamental success factor in building an agile web. Although difficult to assess quantitatively, a correct assessment of this factor is key to the future of the new organization.

At the risk of sounding heretical, we believe that market opportunities do spur the initiation of a virtual organization but do not necessarily make it successful. However, a determined group of entrepreneurs will be able to identify or create, if necessary, the market opportunities for their own common purpose. That belief explains why this method concentrates its efforts in the CEOs and owners of the participant companies. Other stakeholders of the future web should be given proper attention once the common purpose has been established. Ideally both should come together simultaneously. However, it is reasonable to believe that if the opportunity comes first, the difficulties already identified will give the new organization few chances of success if the common purpose is not established more

quickly than the opportunity window. This restraint does not mean that competencies should be stated without connection to the market or competitive environment. It only suggests that the description of competencies take those restraints into consideration through the leadership's assessment of those conditions and their determination to use them in its present state or to transform them by their activity.

This rationale also explains why the assessing team should go to great lengths to protect and contribute to the trust building process (making no recordings, giving utmost importance to proper wording, using a recognizable format, being sure the edition of the final report is agreed upon by all participants, making appropriate report circulation, putting an emphasis on binding factors etc.). The rationale also puts in perspective the role of the present individual capabilities of each participant of the agile web. They will continue to be the foundation for competitiveness as a single entity.

An additional observation deals with the role of present competencies. The assessing team should try to use them only as a bridge to the future, not as a road to the future. Present competencies simply indicate what a company could do yesterday or what it can do today. However, it is a mistake to take for granted that these strengths can always set the direction for the future. What people have now or have had in the past cannot accurately forecast the future, even if using that data is the most logical, and sometimes the only reliable way of building confidence about their future achievements.

It is the level of commitment, willingness, and determination, that makes a web succeed. All existing Knowledge & Skills, Technical and Managerial systems now in place are evidence of what individual web members achieved when they were

committed to some purpose in the past. But these achievements should not be misconstrued as the "always certain" sign posts to the future. As an example, consider the difference between companies that survived technological innovations which made complete industries obsolete (the introduction of the transistor or the compact disk) and those that adapted and survived. The problem was not the direction set by technical or managerial capabilities at the time of the introduction of the innovative change, but rather the company's commitment to change for survival.

The Agile Web seeks that kind of commitment to change not only at the time of crisis, but also at the time when it should be done -- that is, when the individual companies are doing satisfactorily and seeking growth. In doing so they interpret their own true core competencies to be deeply rooted in the business core values, ethics, and entrepreneurial competencies. Their present systems are only a bridge; the future direction after the bridge will be determined by their commitment to a common purpose.

There is great difficulty in capturing in words the final set of core competencies of each agile web, and once captured only the participant members can relate to those words with the full meaning upon which they agreed. It is usually observed that once companies have agreed in real life, the written words, although still important, are not the most important part of the agreement.

Core competencies are a highly rich construct containing notions that cannot be fully expressed in one or two sentences. The words are used to evoke the full meaning and to offer a snapshot of the core competencies to outsiders. So there are several ways to express those core

competencies, all of them valid, and such variation is what usually happens when several participants in the accord are asked to define them. All of the participants state the core competencies in different words and agree with each other's definition in their own words because they perceive in them the same nature and the same set of shared business core values.

To illustrate this case, in the Agile web case the way the group preferred to state the core competencies was:

- 1) A high level of commitment to web success through customer success.
- 2) A holistic view of the value chain across partners and time.
- 3) A shared value of lot sizes in any quantity.
- 4) A shared believe in the value-added potential of its human capital.
- 5) Value-added creation through innovative design and leading edge technology used in areas where high ethics and fairness are key issues.
- 6) An open mind to opportunity across conventional barriers of industries.

For instance, statement number two could also be described as, "acknowledging the people-to-people nature of business," meaning exactly the same core competency. Only when a company acknowledges the people-to-people nature of business does it

care about relationships, and this fact defines its need to be trustworthy and to conduct business with fairness and high ethics now and in the future, and to commit to go beyond the written word in the service to customers. A company then understands that it forms part of a value chain in which all partners need to make profits to keep it active, and each member knows it must keep itself available to new opportunities for the creation of new value chains. It is this core value that will determine the type of managerial practices, the type of skills that need to be in the organization, the type and configuration of the technical resources that should be in place, and the risk and reward policies that should form the basis of the compensation plans.

A similar deployment can be done for each of the above competencies, and what is important is that the CEO group can look at them and relate to the feelings of commitment and purpose that were built during the process.

5.0 Conclusion

A new and improved method to determine the core competencies of an organization has been described. It is especially applicable to virtual organizations and agile webs in their formation stages. It is expected that the improved method will decrease the process time and improve the quality of the results.

Annex 1 : Manufacturing Processes Capability Template

PROCESS	CAPABILITY	AVAILABLE/TOTAL CAPACITY
Abrasive Blasting Descaling		
Abrasive Jet Machining		
Adhesive Bonding		
Age Hardening		
Air Arc Cutting		
Air Gun Spraying		
Air Quench Hardening		
Alignment		
Alkali Degreasing		
Annealing		
Anodizing		
Arbor Milling		
Assembly		
Atomic Hydrogen Welding		
Austempering		
Automated Gauging		
Axial Powder Compaction		
Band Filing		
Band Sawing		
Barrel Tumbling Deburring		
Belt Sanding Descaling		
Bending		
Blanking		
Blasting		
Blow Molding		
Board Design and Layout		
Board Population		
Bonding		
Boring		
Brake Forming		
Brazing		
Broaching		
Buffing		
Bulk Laminating Hand Lay-up		
Bulk Laminating Spray Lay-up		
Butt Welding		
Carbon Arc Welding		
Carbonitriding		
Carburizing		
Casting		
Cavity-Type Electrical Discharge Machining		
Cement Bonding		
Centerless Grinding		
Centrifugal compacting		
Chemical Degreasing		
Chemical Finishing		

PROCESS	CAPABILITY	AVAILABLE/TOTAL CAPACITY
Chemical Pickling Descaling		
Chromate Conversion		
Circular Sawing		
Cleaning		
CNC		
Coating		
Coiling		
Coining		
Cold Chamber Die Casting		
Cold Heading		
Combustible Gas Welding		
Compound Die Drawing/forming		
Compression Molding		
Continuous Casting		
Conventional Blanking		
Conventional Spinning Sheet Forming		
Cored Sand Casting		
Corrugation Bending		
Curing		
Curling		
Cutting		
Cyaniding		
Cylindrical Grinding		
Deburring		
Deep Drawing		
Designing		
Die Casting		
Die Threading		
Diffusion Hardening		
Dinking		
Dip Brazing		
Dip Soldering		
Direct Extrusion		
Drilling		
Drop Forging		
Dry pressing		
Electrical Discharge Machining Grinding		
Electrical Discharge Machining Sawing		
Electrical Discharge Machining Wire Cutting		
Electrochemical Deburring		
Electrochemical Grinding		
Electrochemical Machining		
Electrochemical Milling Cavity Type		
Electroforming		
Electrohydraulic Forming		
Electromagnetic Forming		
Electron Beam Cutting		
Electron Beam Welding		
Electroplating		

PROCESS	CAPABILITY	AVAILABLE/TOTAL CAPACITY
Electropolishing		
Electroslag Welding		
Electrostatic Coating		
Embossing		
Enameling		
End Milling		
Engineering		
Etching		
Explosive Compacting		
Explosive Forming		
Explosive Welding		
Extruding		
Extrusion Molding		
Fabrication		
Filament Winding		
Filing		
Fine Blanking		
Finishing		
Firing		
Flame Cleaning Descaling		
Flame Hardening		
Flexible Mold Casting		
Foil Rolling		
Forming		
Four Axis CNC		
Friction /Ultrasonic Soldering		
Full Annealing		
Full Mold Casting		
Furnace Brazing		
Gas Flame Cutting		
Gas Metal Arc Welding (MIG)		
Gas Torch Braze Welding		
Gas Tungsten Arc Welding (TIG)		
Gauging		
Gear Cutting		
Gear Hobbing		
Gear Milling		
Gear Shaping		
Glassing		
Green Sand Casting		
Grinding		
Grinding Descaling		
Hammer forging		
Handling		
Heating		
Heliarc Welding		
Hobbing		
Honing		
Horizontal Boring		
Hot Chamber Die Casting		

PROCESS	CAPABILITY	AVAILABLE/TOTAL CAPACITY
Hot Dip Coating		
Hot Melt Bonding		
Immersion Chemical Milling/		
Impact Extrusion		
Indirect Extrusion		
Induction Brazing		
Induction Hardening		
Induction soldering		
Infrared Brazing		
Infrared Soldering		
Injection Molding		
Inserting		
Internal Grinding		
Investment Casting		
Ion Beam Cutting		
Ion Plating		
Iron Soldering		
Isostatic Powder Compaction		
Jet Machining		
Jig Boring		
Joggle Bending		
Knife Deburring		
Knurling		
Lancing		
Lapping		
Laser Beam Cutting		
Laser Beam Welding		
Laser Etching		
Lathe Boring		
Lathing		
Leveling		
Liquid Phase Sintering		
Machining		
Making (see Fabrication)		
Manufacturing		
Martempering		
Measuring		
Mechanical Assembly		
Metal Bath Dip Soldering		
Metallizing		
Milling		
Miniature Parts Assembly		
Miniature Parts Fabrication		
Mold Making		
Molding		
Mounting		
Multilayer PCB Fabrication		
Nibbling		
Nitriding		
No-Bake Mold Casting		

PROCESS	CAPABILITY	AVAILABLE/TOTAL CAPACITY
Notching		
Oil Quench Hardening		
P/M extrusion		
P/M Rolling		
Painting		
Parting/Grooving		
Parts Procurement		
Pattern Making		
Percussion Welding		
Perforating		
Permanent Mold Casting		
Phosphate Conversion		
Photo Etching		
Photochemical Milling		
Pierce Rolling		
Piercing		
Plasma Arc Cutting		
Plasma Arc Welding		
Plaster Mold Casting		
Plate Roll Bending		
Plating		
Plunge EDM		
Polishing		
Positioning		
Powder Coating		
Precision Alignment		
Precision Boring		
Precision Grinding		
Precision Positioning		
Press Forging		
Pressing (compacting)		
Pressure (cold) Welding		
Process Annealing		
Procurement		
Progressive Die Drawing		
Progressive Roll Forming		
Projection Welding		
Proofing		
Punching		
Quench Hardening		
Reaming		
Reciprocating Filing		
Reciprocating Sawing		
Repairing		
Resistance Brazing		
Resistance Soldering		
Resistance Welding		
Reworking		
Riveting		
Robotic Painting		

PROCESS	CAPABILITY	AVAILABLE/TOTAL CAPACITY
Robotic Welding		
Roll Forging		
Roll Forming		
Rotary Shearing		
Rotational Molding		
Routing		
Rubber Die Drawing/Forming		
Rust Proofing		
Sandblasting		
Sand Casting		
Sanding		
Sawing		
Schematic Generation		
Screening		
Sculpting		
Seam Welding		
Seaming		
Selective Laser Sintering		
Shaping/Planing		
Shaving/Trimming		
Shear Spinning		
Shearing		
Sheet Laminating		
Sheet Rolling		
Shell Mold Casting		
Shielded Metal Arc Welding (SMAW)		
Short cycle annealing		
Shot Peening Preparation Descaling		
Silk Screening		
Simple Rigid Die Drawing / Forming		
Sintering		
Sizing		
Slip Casting		
Slitting		
Solder Reflow		
Soldering (see also Welding)		
Solid Phase Sintering		
Solvent Degreasing		
Spot Welding		
Spray Chemical Milling		
Sputtering		
Squaring		
Staking		
Stamping		
Steel-Rule-Die Blanking		
Straight Angle Bending		
Straightening		
Stress Relieving		
Stretch-Draw Forming		
Structural Rolling		

PROCESS	CAPABILITY	AVAILABLE/TOTAL CAPACITY
Stud Welding		
Submerged Arc Welding (SAW)		
Subzero Cold Treatment		
Superfinishing		
Surface Grinding		
Swaging		
Tapping		
Tempering		
Testing		
Testing Automatic		
Thermochemical Deburring		
Thermocompression Bonding		
Thermoform Molding		
Thread Cutting		
Thread Forming		
Thread Milling		
Thread Rolling		
Torch Brazing		
Torch Soldering		
Transfer Molding		
Treating		
Treating Heat (Heat Treating?)		
Trimming		
Tube Bending		
Tube Drawing		
Tube Fabrication		
Tube Flaring		
Tube Intraforming		
Tube Swaging		
Turning/Facing		
Ultrasonic Bonding		
Ultrasonic Cleaning		
Ultrasonic Degreasing		
Ultrasonic machining		
Ultrasonic Welding		
Upset Forging		
UV Curing		
Vacuum Metallizing		
Vapor Degreasing		
Vertical Boring		
Vibratory Deburring		
Vibratory Finishing Deburring		
Water Quench Hardening		
Wave Soldering		
Welding		
Wet Forming		
Wet Painting		
Wire Brush Descaling		
Wire Coiling		
Wire Drawing		

PROCESS	CAPABILITY	AVAILABLE/TOTAL CAPACITY
Wire EDM		
Wiring		
Zinc Plating		

Appendix C

Moving Small Firms toward Agility: Agile Business Practices in Agile Web Firms

Because of the innumerable variations that characterize manufacturing and commerce, a precise definition of agility remains elusive. Most simply put it is the ability to thrive in an environment of continuous change. But how does a company get there? That is, what practices must a firm employ to make thriving in such an unpredictable environment possible? Observers of modern manufacturing have been pursuing these questions over the past few years and have arrived at some tentative results. Some of the qualities an agile organization must possess include the ability to realize short product-cycles; to quickly out-source and partner with other firms; to excel at low-volume, high-variety production; to utilize empowered teams; and to have customer responsiveness pervading every aspect of the organization.¹

Initial 'Improvement Opportunities'

While achieving all of these characteristics has proved a formidable task for even the most advanced world-class organizations, some marked progress has been achieved in moving the members of Agile Web forward on the path to agility. As part of their evaluation of the core competencies of the prospective web members, the Ben Franklin Technology Center (BFTC) team commissioned a thorough review of the companies'

¹Rick Dove, "Agile Practice Reference Models," *Production* (July 1995).

existing business practices. The initial assessment of business practices identified several "improvement opportunities" existing throughout the Web, which the group needed to address in order to move toward a more agile, high value-adding supply chain.² Although most companies excelled at the technical aspects of manufacturing tied directly to their production-related capabilities, other areas in need of attention surfaced on the managerial and support sides of members' businesses. Some of the recurring issues that needed to be addressed, in order to transcend traditional business and achieve agility, included a lack of adequate strategic planning and shortcomings in human-resource operations. Similarly, the sales and marketing functions of most of the firms represented another non-production element demanding attention. Furthermore, troubles related to support systems also existed in the members' information mechanisms and capabilities. These areas of strategy, communication, and marketing, then, represented some of the critical issues upon which the member companies needed to focus in order to resemble agile competitors.

Focusing on **information systems**, the BFTC has made a significant effort in buttressing and, where necessary, helping to revamp the information mechanisms of the member companies. Preliminary steps included installation of PCs for EDI and E-Mail. Long-term goals, and indeed actions already begun, are focused upon implementing

²J. Mitchell Associates, "Business Practices Review Summary," mimeo. (Warrington, Pa.: J. Mitchell Associates, 1995), pp. 9-11.

state-of-the-art, inter-firm project management software. In addition to allowing Web members to collaborate in real time, the envisioned electronic-information system will also provide instant updates on project status to Web management and the interested customer.

The issue of **strategic planning** has been addressed by virtue of the very essence of the Agile Web pilot project. The whole concept of agility revolves about re-focusing a company's strategic vision toward providing a total and customized solution for each customer. By helping each company recognize, at the CEO level, the absolutely essential need to focus on customer delight, the project has helped each company-leader recognize the need to adapt, modify, or restructure his company accordingly. Among the most critical elements in a successful business transition toward agility is making a company reconfigurable and having its personnel recognize the validity and salience of "competition through cooperation." By the very fact of participation in the project, companies are learning and making progress toward the ability to mobilize new resources, and thus find new market opportunities, through partnering with other firms in virtual organizations.

These new components of company strategy have, in turn, led directly to changes in **marketing** approaches. Embarking into the realm of virtual enterprise has forced companies to assess, and in some cases re-think, just exactly what their core-competencies are, beyond simply the physical and technical aspects of their plants.

This process of re-evaluation has helped them to recognize the need, especially in the increasingly competitive global environment, to assess and then capitalize upon their managerial and human resources, as well as their technical capabilities, to find and target appropriate niche markets. Integral to this process has been helping companies realize how they can enhance their value-add possibilities, and thus increase their opportunities, by complementing their competencies with those of other firms. Through the help provided by BFTC both in identifying members' core competencies and in training support, companies have migrated from a philosophy of "selling what they produce" toward a more agile approach of configuring their capabilities to respond to existing and potential, but specialized, niche markets.

Observed Agile Business Practices

In addition to the areas identified through the preliminary assessment of business practices, the BFTC team has also witnessed, and where possible has helped to nurture, examples of notably agile behaviors exhibited by the participating companies. Especially encouraging and noteworthy illustrations include:

The Development and Use of a Core-Competency Database: More than merely providing an inventory of web capabilities, this has been designed to help participating companies first realize, then focus on, their existing strengths, including expertise as well as technology. The identification of companies' specific, and unique,

competencies serves to clarify the roles each can play within the broader framework of the web, and ultimately to give rise to virtual enterprises finely tuned to each market opportunity.

The process involved in the preparation of an early bid demonstrated how core competencies go beyond just physical capabilities. One of the web's first bids called for sheet metal and plastics fabrication. At the outset of the project, it appeared that several firms within the web might be competing with each other to perform the same work. As the members of the web collaborated, however, they discovered that the expertise of each firm actually differed from the rest when specific production tasks were considered. Hence, the erstwhile competing firms found it not only possible, but advantageous, to cooperate by bringing to bear their unique expertise in the more specialized facets of the production scheme.

Explicit inter-firm teams, now led by company CEO's, structured to focus on marketing, operations and entity concerns, in order to transform both each individual company and web-wide approaches into agile strategies: By making available and utilizing information and expertise that might be held by only a few participating firms (e.g, sales and marketing savvy as well as production know-how), the Web can thus exploit specific capabilities for the benefit of the entire group. Furthermore, the use of teams to mobilize this information has led to tighter inter-firm integration and mutual confidence. These tight linkages, and the convivial inter-firm

relations which they have fostered, have led to a willingness among the Web firms to contribute resources to a production effort even in cases when a particular company itself is not involved explicitly in a specific project.

For instance, one example existed in the case of a metal-finishing firm sharing a technique with another metal-working firm. Other cases include the ongoing exchanges of sales and marketing methods in the web's marketing team. This has resulted in a flexible, responsive system capable of providing truly innovative and complete solutions.

As partnering among firms and mobilization of resources need to be more and more rapid in the face of ever-increasing concept-to-market cycle-time pressures, flexible and less cumbersome legal arrangements are essential for agile competitors. In this light, the development and use of *innovative legal/contractual arrangements*, such as virtual organization agreements (VOAs) and a joint ethics statement among the Web members, have been especially significant. Demonstrating a willingness to forego the inhibitive binds of traditional legal arrangements, the members have committed to each other, and have accepted these commitments from each other, through a non-traditional "ethics statement." Although not legally binding, the ethics statement describes a commitment from all the participating companies to be "impeccably honest," "to commit to continuous improvement," to respect confidence of other members "by not disclosing or utilizing trade secrets or other sensitive information," to

"not compete with the Agile Web," and to "respect and accept the decisions and consequences of the Agile Web President and/or the Agile Web Board." By combining the overarching ethics statement, which governs general web conduct, with a standard virtual organization agreement, which provides guidance for specific projects, the Web has thus put into action what the progenitors of agility have identified as a need to adopt a new, forward-looking legal attitude of "doing business with a handshake," thereby reducing the role of attorneys and their degree of involvement. Along these lines, other unique legal approaches, like a simplified non-disclosure agreement to protect intellectual property, continue to evolve as the demands of collaboration require them.

The coordination of quality systems among all of the participating companies:

Above just fostering the pursuit of quality within each firm, the web is coordinating the quality systems and ongoing improvement projects of all member firms. The convergence of quality systems has enabled the web to market the entire group, and thus every possible VE arising from it, as a single-source supplier.

Development of innovative customer-response mechanisms like "Resource Teams,"

aimed at providing total, and customized, solutions: Unlike in conventional lead-subcontractor relationships, teamwork and partnering among Agile Web companies begin at the earliest stages of customer contact. By immediately bringing to bear the

expertise and resources of all the firms that might have something to offer to a project, the web provides a customized solution for each customer. In addition to cost advantages, the Web, by being able to mobilize a range of techniques and technologies, is able to compare and implement alternative methods of production, and thereby optimize design plans by considering manufacturability up front. Thus, by bringing all the resources into the process at the inception of a project, the web infuses concurrency into all aspects of the production process, from the initial concept through final delivery. This full integration of all steps of the process thus precludes production foul-ups and attendant bottlenecks by meshing design and operation know-how at the outset.

The importance of this has been demonstrated in many bid-proposal scenarios. For instance, in considering metal-working designs, the Web has been able to mobilize stamping, machining, and casting capabilities in order to evaluate just which will provide the customer with the appropriate solution in terms of things like price, performance, and quality.

The device of a "Web President" illustrates another innovation. Beyond a 'manufacturing rep,' the President, fully knowledgeable about all of the members' core competencies, provides the customer with a single point-of-contact beyond the sale. In addition to possessing the authority to assemble the Resource Team, the President continues to coordinate and manage the project beyond the initial customer-contact

phase, providing the customer with both continuity in dealing with the web and hands-on management of the supply-chain throughout the entire production cycle.

The pursuit of Web-wide improvements in delivery, response, and workforce skills:

This has included the use of service providers like the Electronic Commerce Resource Center and the Agility Forum, in addition to other regional academic and support organizations. These groups have provided services ranging from technical assistance in enhancing their use of information technology to the improvement of human resources and the development of strategic vision among company CEOs.

Firms' levels of sharing information have increased: Accelerated by inter-firm familiarity gained through plant visits and cross-company teams, sharing of important information has been particularly noteworthy in the transfer of specific production-related techniques from one firm to another. In addition to joint collaboration on a specific project, this has also been apparent in instances where the skills are only indirectly related to the project at hand. Web members have nevertheless done so in the belief that generosity will pay off later in the form of increased web opportunity and resulting company profits.

Other developments, too, reflect members' increasing faith in one another. As members have become more confident in each other's capabilities, they have begun to pay fellow companies the ultimate compliment by bringing their own long-term, most

highly-valued customers to the web. This has occurred even in cases in which a company depends on the customer for a majority of its existing business. As this episode reveals, web participants are clearly seeing a benefit in their ability to market themselves, and to provide greater value-add for their customers, as part of Agile Web, compared to going it alone.

Pursuit of a high level of inter-firm integration: The first steps in this direction have included enhanced "real-time" communication, achieved through the installation of, and training in, electronic communication forms such as EDI and E-mail. From these fundamental measures, the team is moving forward in implementing project-management software that will make possible full concurrency in all facets of business among all members involved in a given project. Through the sharing of resources and even actual production facilities, along with the exchange of engineering and design talent, the Web continues to target full linkage of business processes as an ultimate goal.

Adapting members' expertise and applying it to new industries and untapped markets: Moving away from the mass-production mindset of attempting to achieve ever-diminishing economies of scale in tired and obsolescent dedicated product runs, Agile Web is predicated upon a new outlook. Combining the core competencies of each participating organization with the capabilities of other firms gives rise to new

configurations that will be able to provide new and unforeseen products and solutions. Such diverse proficiencies are paramount for success in markets characterized by ever-changing customer demands and product opportunities. By bridging capabilities across firm lines, individual companies can penetrate markets that would have remained entirely inaccessible had they attempted to continue to go it alone. In this way, through the myriad permutations made possible by matching up the various member capabilities, the web can truly synergize its product offerings and thus multiply the market possibilities for all its members.

Utilizing innovative training techniques such as simulations in order to develop both trust and the requisite methodologies to form Virtual Enterprises: Rather than waiting upon opportunities to present themselves and fashioning an approach in response, the web has assertively prepared for opportunities and fostered teamwork and a collaborative mindset by employing several team-building techniques. These have ranged from more traditional informational seminars to innovative group simulations.³ Not only have these methods increased member confidence in each other, but they have also been instrumental in developing collaboration methodologies, like process-flow models, and tools to facilitate cooperation, like the standard Virtual Organization Agreement. Ongoing use of these devices will enable Agile Web to continually strengthen cross-company ties and re-invigorate customer responsiveness.

³For a description of the simulations, see the case study, "Developing Trust Among Members of Agile Web."

In sum, then, Agile Web firms have begun to demonstrate new, more agile business practices in the form of enhanced customer response through tighter integration both with each other and the customer. By capitalizing upon expertise already existing within individual firms and employing a range of new techniques, information technologies, and innovative business and legal approaches, Agile Web's participating companies have begun to transcend business-as-usual and move beyond the limitations of traditional business associations and networks. Meeting the challenges of "virtual enterprise," Agile Web's firms have begun moving toward the elusive goal of becoming truly "Agile Competitors."

Appendix D

Developing 'Trust' among Members of Agile Web

In studying the "collaborative advantages" of business alliances, Harvard Business Professor Rosabeth Moss Kanter has found that "the best intercompany relationships are frequently messy and emotional, involving feelings like chemistry and trust."¹ Echoing Kanter's stress on the importance of managing partnerships in human, and not just financial, terms, the early work in the Agile Web Pilot Project focused on the establishment of familiarity and trust among its members, realizing that these were prerequisites to more involved and intricate business interaction. The absence of real working experience through actual projects, however, has presented the Agile Web with a special challenge. Thus, in order to move the involved firms up to the level of comfort required to permit the rapid formation of virtual organizations, several steps were undertaken to jump-start the process of building mutual trust.

As a first step in generating a common vision and shared sense of ownership, the BFTC support staff organized the group of independent companies through a specific document that outlined a model of Agile Web as "an enabling infrastructure for companies to come together as virtual concerns to meet customer needs through new, faster, smarter processes." From this original model, the staff worked with the members to jointly develop a fully elaborated business plan which outlined their shared

¹Rosabeth Moss Kanter, "Collaborative Advantage: The Art of Alliances," *Harvard Business Review* 72 (July-August 1994): 96-108.

philosophy, desired practices, and business goals. The Agile Web team realized that establishing a set of explicit objectives, which would provide a clearly defined road map of where the group wanted to go, was a prerequisite for meaningful interaction and cooperation.²

Moving forward from defining the group's relationship and in order to move the members toward a threshold of cooperative comfort, the BFTC group held a one-day workshop at its facility both to inform members about agility and to introduce the members to each other. At the meeting, CEOs exchanged company literature and a few even brought sample products for others to examine. Familiarity gained through such direct and hands-on activities moved the companies to a level of interaction beyond that possible by the brokered, arm's-length discussions that have characterized small-firm associations in the traditional business environment.

Still, nothing can truly replace real business activity for giving a company an accurate feel for partnering with other firms. In the absence of real business opportunities, however, the BFTC group arranged the next-best thing. Early on in the pilot project, the Staff developed a tool to increase firms' knowledge about each other: a simulation of a real-world bid situation. Two sessions were held wherein a "customer" made a

²The Web's actions here parallel Katzenbach and Smith's critical steps for insuring Team Success, namely, having "specificity of performance objectives" and the enumeration of specific attainable goals. Jon R. Katzenbach and Douglas K. Smith, "The Discipline of Teams," *Harvard Business Review* 71 (March/April 1993): 113-14.

request for a quote to which the Agile Web company-reps jointly came up with a response.

In the first such experience, the CEOs from the member firms met at the BFTC for an all-day session. Each CEO was then given a fact sheet describing a make-believe company of which he would be in charge. Each company was given a set of capabilities, related to the manipulation of paper (e.g., folding, cutting, painting, etc.) that would be needed to produce the desired product--a paper fan blade.

Facilitated by the BFTC staff, the group responded to the fictitious customer request that came by way of a similarly fictitious Agile Web advertisement. The "customer" presented the team with a prototype fan blade, which demanded some relatively precise engineering standards. It was then left up to the WEB to decide who would perform which functions, to share the necessary information, to come up with a bid, and then, ultimately, to produce and deliver the product.

Issues reflecting the need for inter-firm trust soon presented themselves. First and foremost in preparing a bid came the matter of sharing of companies' proprietary information on labor, material and delivery costs. Members realized that what heretofore may have been considered privileged and protected, needs to be shared in order to make agile collaboration work. Effective collaboration, and pricing, necessitates the availability of sensitive information on costs; without it, competitive pricing cannot be optimized and business will be lost.

Another issue that arose, and one certainly critical to agile manufacturing, was the use of teaming in the production process. Moving away from going-it-alone-is-best mindset, two companies agreed to team to fulfill the painting portion of job. Believing that while in the short-term more revenue might be obtained by performing all functions in-house, each member realized that, in the long-run, more success would be achieved by the quicker response-time, and hence greater-value added, afforded through partnering with another firm.

After completing the bid phase, the companies moved into production. Quickly, the need to clearly define pre-production planning became apparent. The logistical, communication, and decision-making demands inherent in a virtual enterprise emerged even more fully once the cutting, folding, and painting began.

To resemble a real-world situation, the facilitators imposed physical constraints of limited time and access on the process. Rather than merely running over to another table, the participants had to attempt to deal with arising production challenges through formal communication channels. Such constraints highlighted the need for enhanced inter-firm communications, like EDI and e-mail, to make such collaboration feasible.³ Moreover, and emerging as one of the primary lessons of the entire episode, the arising and unpredictable challenges intrinsic to virtual enterprises led the members to realize the need to rely upon, and develop trust in, their fellow Agile Web participants.

³See the case-study on information technology's role in agile collaboration, (forthcoming).

Another exercise coordinated by the BFTC team reinforced these lessons. After the first simulation, the Agile Web players actually went on location to meet a customer and respond to a request for a quote (RFQ). Unlike the first experience, which was entirely fictitious, this simulation, discussed above, moved a step closer to reality. To set up this scenario, the BFTC team arranged for a real-world electronics supplier to make a request for a bid on a hypothetical electronic-control device. The acting president, a BFTC staffer, in accordance with the Agile Web business plan, selected the appropriate companies based on their core competencies. The selected members, or "resource team," then went on location to the supplier in order to hear, first-hand, his requirements, and then respond to his request.

Although this involved only the RFQ phase, and did not move through to a simulation of the production phase, the session was especially helpful in developing an understanding of the real process flow that would result from the involvement of the actual member companies in an Agile Web project.⁴ By addressing the specifics of what would transpire in the event of a real production project, the members themselves recognized several critical areas in which they would need to rely upon their trust in fellow Agile Web members. In addition to the cooperation and teaming central to virtual enterprise collaboration that had been recognized in the first simulation, the

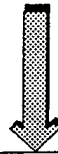
⁴For a more detailed treatment of the mechanics related to customer response, see the discussion of "Customer Resource Teams" in the study, entitled, "Moving Small Firms Toward Agility: Agile Business Practices in Agile Web firms."

participants also found that all possible contingencies could not be predicted and treated contractually. Hence, matters such as punctuality in delivering subassemblies and assurances of quality had to be relegated to trust in Agile Web members. Similarly, members showed a universal willingness to trust their fellow members to find an appropriate subcontractor to fulfill obligations for a given project, in the event of unforeseen circumstances which might affect a member's ability to perform.

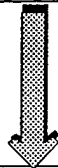
While the mettle of these commitments needs to be tried in the heat of the actual, and not just virtual marketplace, through the course of the exercise the members did demonstrate a readily observable level of comfort with each other. In addition to further informing each other of each firm's technical capabilities, the participants gained a familiarity with fellow members' business approaches by discussing just how each would respond in an actual situation. This kind of interaction has helped Agile Web begin to navigate through the "soft" but critical matters of chemistry and trust, moving them closer to realizing "collaborative advantages." In the absence of real-world business interaction, the simulations have proved effective tools, not only in helping members to acknowledge the salience of mutual trust in the operation of virtual enterprises, but also in achieving significant progress in forging those important bonds.

Agile Approach to Identify Qualified Customers

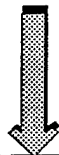
A. Identify customer opportunity and initially qualify.



B. Form the right Web Client Qualification Team based upon characteristics of opportunity.



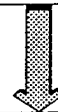
C. Meet with customers to explain the Web.



D. Gather data to qualify customer, and to match the opportunity to the Web competencies.

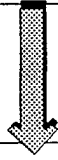


E. The Web Client Qualification Team evaluates the customer's response and makes a bid/no bid recommendation to the entire supplier Web via E-mail.

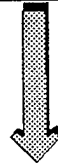


F. Present information about the opportunities to the entire Supplier Web via E-mail.

G. If the team recommends the project for the Web, proceed to step I.



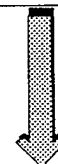
H. If the Evaluation Team does not recommend that the Web should pursue the project (based on the qualification criteria), any individual company will have the opportunity to organize a Web response.



I. Any interested Web suppliers will meet and form the Web Response Team. (The team will vary for each customer opportunity.) The team will create a proposal for the customer.

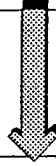


J. Fill in Memos of Understanding within the Web and with the customer.



K. Meet with customer to present proposal.

L. Customer accepts proposal.



M. Customer signs contract, and the project begins.

AGILE WEB AND OUR COMPETITION

	Continuous Change	Time to Market	Focus Area of Product Life Cycle	Surge Capacity	Communications	Optimization of System	Culture/ New Business Practices	Business Opportunities
Cross Industry Agile Web	Business practices supported by new technologies & breakthrough changes; strategic focus	Rapid Response, shorten cycle	New product development through initial production	Competitors in the Web back each other during schedule fluctuations	Partnerships enhanced through technology fostered through Agile Web, Inc.	Nuggets/solutions from cross industry system to give the customer enhanced solutions	Teaming & new business practices; focus on core competencies; Proactive approach	Seek markets where the customer is looking for more value added solutions
Enhanced Single Industry Supply Chain	Tactical business practices supported by technology; customer driven incremental changes	Operational improvements to enhance response to customer; customer driven	Design through re-supply; component development	Capacity via overtime or sub-contract to alternate source	Partnerships enhanced through technology	Limited single industry experience	Will take time to change business as usual thinking; Improve existing business tactics; reactive	Can grow business with current customers due to value-add
Traditional Supply Chain	Focus on incremental change	Low price & on-time delivery	Re-supply; driven by customer RFQ's	Via overtime and subcontracting	Little communication unless there are lead-sub relationships	No system view; Sub-optimization; No value-add solutions unless customer requests	Business as usual	Try to win jobs on low price & on time delivery
Brokered Manufacturing Network	Reactive; driven by change in industry	Meeting delivery schedules	Re-supply with additional capabilities from other members	Competition remains; members will not partner for schedule needs	Lead/sub relationships communicate as required	No system view; sub-optimization	Teaming is possible; may share equipment	Passive marketing
In-House Supply	Meet demands of in-house customer; incremental change	Meet production schedules	Re-supply; driven by other areas of the company	Via overtime	Direct contact with customer, however may be faced with internal barriers	Internal cross functional accountability	Business as usual	Maintain lowest cost for customer
Manufacturer's Consortium	Reactive to issues, not driven by change	Not of importance for the collective group	N/A	N/A	Discuss topics or needs such as ISO, training, insurance, joint purchasing	No system	Informal benchmarking, business as usual	Typically do not look for business opportunities
Another Agile Web	Business Practices supported by new technologies & breakthrough changes, strategic focus	Will be slower than our Agile Web until new practices are defined	Any point in the product life cycle; concept through production	Potential for competitors to back each other	Partnerships enhanced through technology & new practices	Cross industry enhanced solutions	Teaming, focus on core competencies	Markets where customer is looking for value added solutions

Appendix G

Agility Through Incorporation?

Agility in action presents a paradox. Agility, as the conventional meaning of the word implies, denotes a fast-moving, nimble actor. As described by the progenitors of the agility concept, agile corporations are able to rapidly reorganize and even reconfigure themselves in order to capitalize on immediate, and perhaps only temporary, market opportunities. It is readily acknowledged, however, that no one firm will have all the necessary resources to meet every, if any, such opportunity. Given the especially limited resources of smaller firms, realizing short-lived opportunities requires the ability to rapidly team with other organizations and thus assemble "virtual organizations" (VOs) to respond while the chance still exists. After the opportunity has passed and been capitalized upon, the organization then disbands and "disappears the way our laps do when we stand up."¹

Yet in the eyes of those who have carefully considered the demands of competing in the new marketplace, success in the globally competitive environment also depends upon the ability to provide more than a once-and-done commodity transaction, relying instead on an ongoing customer-supplier relationship in which goods and services (often combined in information-rich products) are sold over an extended period. Thus, there is a need to be both

¹Steven L. Goldman, Roger N. Nagel, and Kenneth Preiss, *Agile Competitors and Virtual Organizations* (New York: Van Nostrand and Reinhold, 1995), p. 92.

instantaneous in responding to an opportunity, coupled with, and compounded by, the need to maintain an ongoing interaction with a customer.²

This presents the small to mid-size firm with an especially daunting challenge, namely: How to quickly couple and disband in order to meet opportunity, while still retaining the wherewithal to enjoy the benefits of an ongoing relationship with a customer. Additionally, there also remains the problem of obtaining sufficient knowledge about another firm to effectively assemble any given VO. In the absence of a technological tool, like a F.A.N.,³ some mechanism needs to be in place to provide firms with the requisite knowledge to partner with appropriate firms in order to set up such a VO.

In part to respond to these difficulties and challenges inherent in competing in the agile world through virtual organizations, the Agile Web project decided upon a strategy of incorporation. In light of the demands for rapid response and the seemingly conflicting need for continuity, the WEB as a corporate entity,

²Underscoring the need for some continuity in organizational forms, Womack and Jones have pointed to related difficulties inherent in virtual organizations, arguing that temporary and ephemeral virtual organizations lack the stability requisite for sufficient ongoing inter-company interaction. They claim that "there is no way that such an unstable entity can sustain the collaboration needed to apply lean techniques along an entire value stream." James P. Womack and Daniel T. Jones, "From Lean Production to the Lean Enterprise," *Harvard Business Review* 72 (March/April 1994): 93-103. As discussed below, however, a unique corporate structure might be able to enhance agility while providing continuity.

³Factory America Network (F.A.N.) is the hypothetical electronic database, discussed in Goldman, Nagel, and Preiss's *Agile Competitors and Virtual Organizations* (New York: Van Nostrand Reinhold, 1995), that would provide a comprehensive database containing the core competencies of American businesses. In their vision, companies could then use this source to quickly find appropriate partners to form virtual organizations. See p. 27.

comprising member companies which can be mixed and matched as opportunities warrant, provides a solution addressing both needs. Agile WEB, *incorporated*, provides an infrastructure to allow the rapid formation and reconfiguration of virtual companies, but, by retaining a permanent base, also offers a forum for ongoing customer relations. What is more, it also provides a vehicle through which companies can both become comfortable, and maintain ongoing relations, with each other, thereby making partnering to form VOs much more feasible.

Despite the logic of the decision, the plan to incorporate only evolved as the activities of the WEB got underway. Once more specific thinking was targeted at coordinating the ongoing interaction of WEB members, however, the choice seemed more and more appropriate. The group of companies decided that there needed to be some "vehicle around which to focus [their] efforts." And after weighing the pros and cons of incorporation, the members concluded that such an approach would provide WEB members with a long-term agent to facilitate continued collaboration after government funding has ended.

More than just providing long term stability, which in itself might be considered the antithesis of agility, the incorporation move was designed to bring into focus the point that the member companies were striving to do more than simply pool their individual capabilities. In order to fully *integrate* their competencies, they chose to collectively form a corporation--but not a corporation or even collaboration in the traditional business sense. The resultant corporation provides focus for the group's activities but is not designed to inhibit responsiveness by channeling activity into old practices. Rather, the umbrella corporation is only the conduit through which the member companies can meet market opportunities. In other words, the corporate structure exists only to provide an infrastructure that

allows the formation of virtual organizations which, in turn, consist of the appropriate member companies who possess the core competencies necessary to respond to a particular customer need.

The members concluded that through the focus made possible by joint ownership of, and involvement in, a single entity, they could more easily achieve coordination of various administrative, oversight, and sales and customer-relations functions.

The specific capabilities the corporate structure can thus provide include:

- *The Development of a Coordinated and Focused Strategic Marketing Plan

- *The Capability to Screen and Pursue Specific Business Opportunities

- *The Compilation and Maintenance of a Core Competency Data Base of Web Members

- *Provision of a Single Point of Contact for Customers

- *The Ability to Creatively Reconfigure the Core Competencies, Customized to Each Opportunity

- *Coordinate the Management of Project Teams (VOs)

- *Provide a Mechanism to Ascertain and Implement New Business Practices

- *Search for Other Potential Members and Bring in New Members to Augment the Competencies of the Web

In addition, there were important liability, tax, and anti-trust considerations that factored into the decision to incorporate the Web. Through incorporating as a classification "C," regular for-profit corporation, members of the web are only liable, above the value of their shareholdings (\$1.00 per member), in project contracts in which they are directly participating. The tax consequences of

participation in such an arrangement have been contained by keeping the profits of the umbrella corporation, Agile Web, inc. itself, to a minimum. Accordingly, the entity itself retains only enough money to cover its overhead costs. The rest of the revenues will be disbursed to the member companies, based upon their participation in the respective project. Furthermore, forsaking dividend payments to members will prevent double taxation from taking effect. Finally, anti-trust problems can also be avoided, as in this arrangement members are clearly permitted to share cost-information related to projects being cooperatively undertaken.⁴

In combination then, moving agility into action at the small business level, required a feeling of joint-involvement and ownership, a level of cohesion and coordination for effective customer interaction, and a legal umbrella--all of which were provided through a strategy of incorporation. Despite a few drawbacks, like some additional overhead costs resulting from liability insurance, the trade-off appears to have been a successful one, with members showing an increased sense of involvement. What is more, joint activities now enjoy a level of coordination that would not have been possible given the significant time and resource constraints facing small to midcap firms. Overall, incorporation as a single umbrella-style entity has been a unique and integral step toward making the agile practice of forming virtual organizations a reality for the small manufacturers of Agile Web.

⁴A more extensive discussion of legal issues pertinent to the operation of a Web is provided in a case-study devoted entirely to the subject (forthcoming).

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Appendix H

Legal Issues in Agile Collaboration: The Agile Web Pilot Project

Driven especially by the need to better coordinate and focus its activities, the Agile Web considered several organizational alternatives, including the establishment of a limited liability company and a limited liability partnership, as well as the move to incorporate. In addition to each option's ability to govern the group, concerns over the limitation of liability, the members' ease of entry and exit, and the resulting effect on customers' comfort also influenced the decision.

As has been shown elsewhere, the strategy of incorporating Agile Web addressed some of the key infrastructural requirements essential to the formation and functioning of virtual organizations.¹ In addition to the key operational and marketing rationale in favor of a corporate entity, financial considerations also proved important. For instance, tax considerations played a role in the group's deliberations, with questions like:

- Will the entity be a taxpayer?
- Will the entity make a profit/have taxable income?
- Will the entity qualify as a tax-exempt/non-profit organization?

all factoring into the consideration of the optimal structure. Other financial considerations relating to securities law also colored the choices available. The matter of liability to be incurred by companies participating in a web presented another important matter to be addressed. In addition, antitrust concerns emerged as one of the most critical areas of concern in the considerations of Agile Web's formal organization.

¹See "Agility through Incorporation: A Case study of the Agile Web Pilot Project."
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Liability Issues Driving the Decision to Incorporate the Web

Beginning very early in the project, during the first months of 1994, the BFTC team began examining legal issues as they pertained to cooperation and collaboration issues involved in the formation of integrated process teams and virtual enterprises. To best facilitate the partnering process, the team considered three organizational options: corporation, partnership, and limited partnership.

While all moves toward a formal organizational structure seemed, at first blush, to impose a rigidity quite contrary to the very essence of agility, other considerations had to be factored in as well.² Among the most significant of these was the issue of liability, in the case that a dissatisfied customer should bring suit. In a conventional partnership, which one might expect to be the obvious choice for agile collaboration, liability is both "joint" and "several." In common parlance, this means that a disgruntled customer could sue all the members of a partnership. Thus, if the various nineteen members of Agile Web are seen in the eyes of the courts as being involved in a partnership, all could be sued, whether or not they were involved in the particular project at issue.

Such a partnership can be construed by the courts even in the absence of formal documentation that explicitly recognizes its existence.³

²See also, Anthony Fiore and David Goldman, "Legal Barriers to Agile Business Relationships," in *Agile Practice Reference Base* (Bethlehem, Pa.: Agile Manufacturing Enterprise Forum, 1995). As is discussed in the "Agility through Incorporation" case study, however, the more formal incorporation structure also provides distinct advantages essential for agile collaboration.

³In some states a "limited liability company" (LLC) also exists, and it was also considered. Since it is not recognized by every state and future tax and liability interpretations remain uncertain, it did not appear to provide sufficient advantage over the C corporation. For a discussion of LLC's see Wayne Wells, "Limited Liability Companies: Something New, Something Different," *Journal of Small Business Management* 32 (January 1994): 78-82.

Above all, since partnership is legally determined by the courts, no matter what is explicitly agreed to, and arranged, among Web participants, all possible contingencies need to be planned for ahead of time. Although insurance liability can be obtained for the various contingencies, the relatively large number of companies would complicate such a process. The establishment of an overarching corporation, by contrast, significantly simplifies many of these issues by clearly, and legally, defining the association of the participants as shareholders of Agile Web, Incorporated.⁴

In the corporate arrangement, each participant in the Web project bought one share at one dollar each. As a result, all eighteen members became equal shareholders in a corporation, entitled Agile Web, Inc., and are liable to the extent of their holdings--\$1.00. The question of who in the world would risk business with a company possessing only \$18.00 in assets is addressed through the subcontracting arrangement that takes effect in every project for which Agile Web, Inc. contracts. As Agile Web secures business with a client, the specific members participating in the project are then secured as subcontractors.⁵ Clients are thus assured of accountability because liability in any given project follows the subcontractors. This arrangement then carries with it the added benefit of separating liability for each contract from members' overall liability that comes through affiliation with Agile Web. Joint and several liability are thus contained. Members are only severally liable in projects in which they directly participate as

⁴Insurance issues still arise within the corporate structure, and will be summarized in a forthcoming study after the Agile Web's plan becomes finalized.

⁵The Web companies are subcontractors in a *legal* sense, but operationally remain much more tightly integrated and engaged with the final customer than is the case with more traditional prime-subcontractor arrangements. See the case study, entitled, "Moving Small Firms Towards Agility."

subcontractors, and jointly liable for all projects only to the extent of their \$1.00 holding in Agile Web, Inc.

Income Tax Liability

As far as taxation is concerned, the corporate arrangement as for-profit C-Corporation is designed to limit liability through the methods of its operation. This is achieved by passing all profits for each job directly along to the participants less only a small amount for the Web's overhead costs. Thus, profit of the corporation itself is limited, preventing any sizable double-taxation from taking effect in the form of capital gains on the shareholdings.

Anti-Trust

Collaboration in the form of virtual enterprises is central to agility. Yet what is viewed from the inside as mutually enhancing and unassailably beneficent cooperation, can be just as easily perceived from the outside as competition-inhibiting corporate collusion. Given the de facto association of the involved firms through their participation in the pilot project, antitrust matters emerged at the outset. Thus, in order to navigate the troubling waters of anti-trust law, from the beginning Agile Web carefully monitored its activities with the assistance of legal counsel.

Although the decision to incorporate made the legal implications of AWI's activities more clear, according to legal precedent, it appears that several important considerations must be observed in order to avoid violation of antitrust provisions.

"Webs" of companies arranged for virtual collaboration on the Agile Web model are very likely to be treated by the courts as "joint ventures" in matters related to antitrust regulations.

American courts have consistently assessed the legality of joint ventures under the “rule of reason.” That is, the courts will consider any potential competition-inhibiting characteristics of an arrangement in light of the joint activity’s overall effect on the marketplace. With webs comprising relatively small manufacturers, in terms of their market share, however, antitrust liability should not be an issue. This is because in most cases “Proof of market power...is a critical first step, or a ‘screen’ or ‘filter’” beyond which a case is unlikely to continue. The Supreme Court has, in fact, stated, “If the structure of the market is such that there is little potential for customers to be harmed, we need not be especially concerned with how firms behave because the presence of effective competition will provide a powerful antidote to [any] effort to exploit customers.”⁶

The issue of antitrust and business collaboration is, however, not entirely predictable and is currently being re-evaluated by observers of the modern business environment. Advocates of unfettered collaboration maintain that American antitrust laws were a response to massive market-controlling industries and cartels that emerged in the late nineteenth century. These organizations so dominated markets, that the consumer was threatened by a lack of competition and resultant price fixing. Insofar as a web’s effect on the customer is concerned, so long as the resulting market share of the assembled firms is not significant, antitrust should not be a concern from a regulation standpoint. There is, however, another target of antitrust litigation with an important history in the American experience, and that is not just the idea of a single monopolistic organization controlling the market and dictating prices. Instead it is the problem of a group of businesses operating in collusion seeking to exclude economic opportunity for competitors who

⁶ George A. Hay, “Market Power and Antitrust,” *Antitrust Law Journal* 60 (1992): 807-08.
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are essential for a free and efficient marketplace. Eliminating antitrust laws in the belief that monopolistic market domination by singular economic giants is now no longer possible ignores this latter concern.⁷

Indeed antitrust law recognizes this. Traditionally, anti-competitive behavior has been characterized as existing in two basic forms: on the one hand, Cartel Behavior, and on the other, Boycotts and Exclusion of Competitors.⁸ While most attention has been paid to the alleged obsolescence of the former, the characteristics of the latter reflect issues quite close to the heart of "agile webs," and these concerns cannot be ignored. Collusive behavior, under this rubric, can mean excluding firms from participating in a joint venture and thus depriving them of vital resources, and crippling their ability to compete. This has been prohibited by the courts because "the evil has been to diminish the overall vigor of competition as well as reduce equality of economic opportunity by injuring and handicapping a portion of the competing units."⁹ Above all, the courts have viewed market-share as most important in determining who enhances or hinders the vigor of the market, and thus webs comprising firms with limited market-share, as is the case with Agile Web, should not be in danger of anti-trust violation.

A problem with relying only on the model of a large concern controlling the market—viz. higher prices—arises by virtue of the fact that "the Supreme Court has declared with no uncertain force that a combination designed to stabilize or even to lower price is no more to be tolerated than one designed to elevate price, for both interfere with the operation of a free competitive

⁷For an example of this way of thinking in addition to Goldman, et al, see Charles F. Sabel et al, "How to Keep Mature Industries Innovative," *Technology Review* (April 1987): 27-35.

⁸Joseph F. Brodley, "The Legal Status of Joint Ventures under the Antitrust Laws: A Summary Assessment," *Antitrust Bulletin* 21 (1976): 453-83.

⁹*Ibid.*, p. 455.

market.”¹⁰ Overall, however, courts have been lenient in their consideration of “smaller firms seeking methods of competing more effectively with market leaders” through use of devices such as joint-purchasing agreements, which would be less benevolently viewed had the involved companies had significant market-share. Nevertheless, the possibility always remains that either a company outside a web or a disgruntled member within a web could sue over being excluded from the group as a whole, or from participation in specific projects within the group. But, given the limited market share of the Agile web companies, anti-trust does not appear to be a stumbling block for web-like groups so long as denial of membership in the group “is reasonably related to operation and no broader than necessary to effectuate the association’s business.”¹¹ Recently, the Department of Justice has echoed the court in its enforcement policy, stating that the Department “generally will be concerned only if...there is no reasonable basis related to the efficient operation of the joint venture for excluding other firms.”¹²

In addition to avoiding anti-trust violations through limiting its market share, AWI has also developed another unique approach to restraint-of-trade issues through an “easy-exit” policy. Merely by selling back its \$1.00 share of Agile Web, a company can choose to compete on a project from which it had been excluded (i.e. not been selected to participate on the resource team by AWI’s president). In this way, AWI has no binding authority to prevent AWI companies from competing if this is their desire. Hence, AWI has no real teeth to restrain trade in any meaningful way.

¹⁰Ibid., p. 465.

¹¹*SCFC ILC v. Visa USA, Inc.* 36F.3d 970 (10th Cir. 1994) citing *National Bankcard Corp. v. Visa, USA*, 779 F.2d 592, 601 (11th Cir.), cert. denied, 479 U.S. 923 (1986).

¹²Department of Justice, Antitrust Enforcement Policy (Nov. 10, 1988) quoted in 1993 Supplement P1506, p. 1105.

Important Reminders

- Membership requirements must be equitable and rationally based
- Sharing of cost-information between firms must be limited to those specific projects in which members sharing the information are involved.
- Easy-Exit precludes restraint of trade in the form of preventing competition.

Importantly, the small size and market-share of both the involved companies and Agile Web, as a whole, limit the appearance of anti-trust violation. Consequently, Agile Web practices, like sharing of cost information on specific projects, that are essential to effective integrated product and process development and integrated product teams appear to be well within the bounds of legal business conduct. As in any given project the resources being brought to bear do not nearly approach a controlling influence in the affected markets, cooperation through Agile Web should not be construed as inhibiting open competition. Likewise, reasonable rules for membership and operation that may even exclude firms from participating should not be declared illegal.

It must be remembered, however, that in the broadest sense, the observations based on the specifics of the Agile Web Project do not guarantee that antitrust law will not be violated. This is especially true for larger firms whose individual and/or combined market share might approach a significant portion of the total market. Consequently, given the interpretive nature of jurisprudence at, and between, all levels of the federal system, the legal examples of the Agile Web pilot project are necessarily limited in terms of their replicability. Nevertheless, the structure put in place by the Agile Web does provide an

effective, and legal, organizational infrastructure that facilitates the rapid formation of virtual organizations, and thus enhances integrated product development.

Epilogue

As government funding came to an end with the official termination of the pilot project on January 1, 1997, AWI found itself needing to raise operating capital. Originally, the group had planned to cover overhead costs by retaining a small percentage of profits. The lack of production contracts, however, negated that approach. Thus, in order to raise money, the Board of Directors came up with something new. They determined \$10,000 to be the minimum contribution necessary for each company to become a full-scale participant in AWI, and amended the bylaws accordingly. Companies contributing this amount would, in exchange, receive 10,000 voting shares of AWI stock. (Investments in excess of \$10,000 would receive non-voting shares, in order to prevent any one share-holder from dominating the corporation.) Original participants could retain a relationship to AWI by keeping their initial \$1 share, but their voting influence would be insignificant.

This change had only a minimal impact on the legal ramifications of the corporate arrangement. For instance:

- *Market share* is still limited; hence, there are no major changes concerning antitrust issues.
- *Liability* is still contained vis-à-vis traditional joint ventures, but some participants' stakes in AWI have been raised from the original \$1 to the new amount invested. As a result, shareholders of AWI are now liable to the extent of the value of their investment, even though they are not part of the virtual firm working on the project in question. (The companies viewed this as a reasonable and necessary trade-off.)
- Double *taxation* is still avoided, as AWI will still pass on the vast majority of profits to the participants involved in a given project--limiting the growth in equity and capital gains.

Agile Web has had to adapt to the vicissitudes of its marketplace experience, and raising the necessary operating capital has forced it to reconsider its original approach. For the most part, however, the only thing that has changed is the amount of direct investment by each company in AWI. And what is more, by preserving the overall corporate structure, AWI has retained the advantages a formal organizational structure provides. Among the most important are the ongoing customer-contact capability and high-level of project coordination, allowing AWI to continue to open up new markets and opportunities for its participants.

Appendix I

Agile Web Ethics Statement

The purpose of Agile Web, Inc. (the "Agile Web") is to bring several manufacturers together in such a way that, through collaboration and cooperation, we can bring higher value services to customers as well as obtain business that we could probably not get working as individual firms. This will increase our individual and collective competitiveness in the marketplace.

For the Agile Web to operate in an environment of trust and cooperation, and for all of its members to gain the benefits, economic and otherwise, of such collaboration, it is critical that all members subscribe to, and comply with, a common set of ethical standards. However, although an expression of values, this Ethics Statement is not legally binding and is not intended to create any legal or enforceable obligation of the signatory.

Thus, as CEO of (company name), a shareholder of Agile Web, Inc., my company subscribes to the following statement of ethics. We will:

... be trustworthy and honest in our dealings with our Agile Web partners. Our chief ethic is to be impeccably honest with other Agile Web members, our customers, our employees, and our suppliers. We recognize that our combined reputations are at stake with each and every Agile Web business opportunity. To insure our combined success, and to further develop trust within the group, we will never mislead any of our partners.

... keep our promises to our partners. We will treat our participation in Agile Web business with sufficient priority, giving it proper attention and balancing it with our regular business, to assure success. We will work with customers and partners to see that all are satisfied with the outcome. We expect to meet our commitments. We will honestly report to all involved, in an open and timely manner, any situation that arises which might impact the success of a project.

... commit to continuous improvement. Quality is defined by our customer, and is given in all that we do. Our organization is committed to a continuous improvement philosophy where we continually strive to reduce costs and improve response time, quality, productivity, and customer satisfaction.

... value our people. It is our people that provide the skills and knowledge required to serve our customers. We will strive to keep our employees informed, and allow them to grow and develop their skills so that they see themselves as part of the team.

... share information within the Agile Web that is necessary to get the best solution for our customers. We will encourage an open give and take of ideas in search of continuous improvement to our products and services. When necessary to develop the best solution for our customers, we will share information with other web members, such as our costs (for a particular potential business opportunity only), current shop loading, changes in loading, our interest/need for the business, and so forth.

... hold confidential all information learned about our partners that is of a proprietary and sensitive nature. As we will learn information about our partners that they don't typically share, we will respect their confidence by treating such information as confidential, and by not disclosing or utilizing trade secrets or other sensitive information discovered through Agile Web activities.

... not compete with the Agile Web. We will not knowingly submit a proposal for business that is in competition with the Agile Web. Even if we leave and are no longer part of the Agile Web, will not compete with the Agile Web on any business opportunities learned while we were part of the Agile Web.

... will respect and accept the decisions and consequences of the Agile Web President and/or the Agile Web Board. This is necessary for the Agile Web to respond in a quick and orderly way to our customers.

(signed)

Appendix J

Developing a Standard Virtual Organization Agreement and Operating Principles in the Agile Web

In order to facilitate the rapid partnering necessary for agile collaboration, the Agile Web set out to design a standard, reusable contract to be put in place each time a virtual organization needed to be created. With such a device at its disposal, Agile Web hoped to improve upon the standard, and time-consuming, subcontracting and purchase-order processes that characterize business interactions in a more traditional model. Based on input from its legal counsel and several brainstorming sessions with the Web companies, the pilot-project team developed a document modeled largely on standard subcontractor and purchase agreements.

The original "VOA" provided a comprehensive document that included rather standard supplier's-agreement contractual language. In matters where such a contract would depend on the particulars of a given project, certain provisions were left blank to be negotiated subsequently on a project-by-project basis. In essence, the resulting document addressed relations between Agile Web Inc. and the participating companies in fulfilling obligations to meet a customer opportunity. Among the areas of activity included in the VOA were standard contract components: negotiated sum, supplier's work, schedule, payments, intellectual property, disclosure, insurance, indemnification, defaults, termination, and claims.

To insure that such a contract could be produced and enacted with little fanfare, the pilot team then tried to secure advanced approval from all of AWI's shareholders. This, however, presented a problem. Although the original VOA applied the standard contractual language one would expect in a project services and supplier agreement, convening the group to discuss a legal document *en mass* may have been a mistake. Assembling the group to hash out the particulars of the VOA had the effect of transforming the group's dynamic into a defensive, adversarial encounter. The language of a legal document, which is necessary to distinguish between the Web as the customer and the participating companies as suppliers, resulted in a dichotomy of participating companies on one hand, versus Agile Web Inc., on the other. This division undermined the feeling of teamwork that has to prevail for such a group to effectively come together and make a virtual organization work.

What at first glanced appeared to be mere balking at some specific language, in actual fact, may have been masking some mission-related problems fueled by the *us-versus-them* nature of legal contracts. Actions of the participating companies seemed to indicate that each was viewing the Agile Web only from the perspective of his own individual company, rather than seeing AWI as a synergistic extension of a partnership among the eighteen firms.

Therefore, in consultation with mission-development specialists, the pilot team rethought the approach to the whole issue. The companies formed a sub group to address each of the team- and mission-related issues that underpinned the more standard contractual arrangements originally expressed in the VOA.

Assessing Business Practices and Developing Operating Principles

As a first step, the team broke apart the original VOA and, rather than continue to look at each in an abstract legal way, began to examine each article of the contract in terms of how each area might actually play out in real-world scenarios. In this way, the team members could look at issues like intellectual property, disclosure, and project management, etc. and get to the heart of how they wanted to act and what they really expected of each other.

For instance, while some of the Agile Web participants had a difficult time in being comfortable with open-ended legal language regarding “time being of the essence,” when they faced such an issue in light of how an actual project might play out, their discomfort waned. Similarly, while many hesitated at the yielding of control over their shop floors that seemed implicit in the VOA’s language concerning project scheduling, when these were addressed in the context of what it would take to meet a project’s requirements, the team readily acknowledged the need for things like full disclosure and vesting the AWI president and project manager with the requisite authority.

With the help of mission-development consultants, the team was able to continue discussion on each of the contract areas and drive toward consensus on the business practices that would be necessary to make a project come together. The pilot team carefully captured the dialogue of the team. Then through some careful editing and condensing of ideas, the team took to the task of drafting a set of operating principles for Agile Web, based on the business practices related to each article of the original VOA.

One of the key breakthroughs for the sub-group was a recognition of the two-part nature of working together as an Agile Web. That is, the companies that constitute a Web have to recognize that, in the context of working on a project, they must view the AWI entity as their customer, and give it the attention and consideration they would normally give without question to a more traditional customer. Second, the companies also have to look to each other, and behave, as team players and not as a series of subcontractors. In order to achieve the best value for the customer, in an agile world the tasks are no longer confined within the walls of one firm. To be effective team players, considerations sometimes have to transcend the short-term interests of the single company in favor of the long-term needs of the whole team. Seeing things from this vantage point, the team was able to overcome the divisiveness of the *us-versus-them*, *supplier-versus-Web* separation that occurred when these ideas were broached with a legalistic document.

As can be seen from a quick glance at the Operating Principles, they reflect the kinds of mission-related, teaming, and partnering issues that go beyond traditional subcontracting behaviors, but which are absolutely essential for effective agile collaboration.

Agile Web Operating Principles

Flexibility in Changing Individual Roles to Satisfy our Customers

When participating in a project, AWI companies will represent themselves to customers as a seamless organization through the Agile Web and its President in a way that transcends the old “lead-sub” model. In dealing with AWI, the customer sees one seamless organization and pays for the final product.

All AWI participants must interface simultaneously with the customer and each other, and will not sit hierarchically removed down the food-chain, waiting for information, bids, and orders. All AWI participants share responsibility for each job.

In order to help each other achieve a new model of full concurrency and interaction, we will engage in improvement projects, such as simulations exercises, that will continually expose us to new, agile ways of performing.

At every level of the product life-cycle there are opportunities to add value. The Web companies must continually work to define these opportunities and must work together to add this value where customers cannot currently get (and in some cases cannot even perceive) this.

The value-added that distinguishes AWI in the marketplace requires that we:

- team together as a single entity under AWI with a united front
- be sensitive to other Web participants' needs, subordinating our normal demands in order to achieve the greater value-add of AWI
- proactively present the combined capabilities of the Agile Web, making informed presentations of the *positive* attributes that other members can bring to a project
- interact with clients and each other to come up with new approaches and solutions that add value at every level of the product life-cycle
- offer any and all of our competencies to other members in support of a project to the extent possible.

- demonstrate flexibility in responding to changing customer requirements by modifying the composition of the project team.

To keep roles clear, participants will not be given work until a memo of understanding has been sent that sets out schedule and obligations. For each project, there will be a statement of work and formal authorization that recognizes work that is compensated.

Project Management

The Project Manager will take on specific roles with vested authority, while the AWI President will provide the overall corporate overview and organization.

Subject to the overview of the President, the Project Manager will have ultimate control over a project, and he will work to find the optimal solution for the customer.

Participant consensus is required for changes when schedule, finance, and/or liability is affected--whenever a company commitment is involved.

Agile Web is about agilely matching and loaning competencies and capabilities, including empowering one's employees to make decisions for others and abiding by the decisions of others' employees.

We will have a project manager's manual to make this process formal.

We will TRUST each other and keep each other INFORMED to ensure that sound decisions are made.

The same consideration will be given to Web projects as is given to all other projects.

AWI companies have a commitment and responsibility to share information up front to head off jams wherever possible.

Pricing

(NOTE: FOR OUR PURPOSES: "COST" IS DEFINED AS THE EXPENSE INCURRED BY A COMPANY TO PRODUCE AND DELIVER A GOOD OR SERVICE, F.O.B. "SELL PRICE" IS DEFINED AS THE AMOUNT OF MONEY THE CUSTOMER PAYS FOR A PRODUCT. "CONTINGENCY" IS THAT PORTION OF THE COST THAT IS ADDED TO THE OTHER COST FACTORS IN ORDER TO COVER POSSIBLE FUTURE EXPENSES THAT CANNOT BE PRECISELY DETERMINED.)

The Web President will not disclose information without written permission from a company, and with permission will do so only on a job-by-job basis. With a customer external to the Web, only cost information necessary to be competitive will be disclosed.

Within the Web, it is useful to share the internal costing rationale and other information, and for the Web to function as team, in order to achieve the best sell-price for the customer.

AWI will not demand internal costing information (e.g. rates, raw materials, etc.), and divulging such information remains an individual company's prerogative.

To avoid inflated prices, we will make it clear if we do not want to participate in a job, and we will not quote on it.

Companies will be willing work as a team to modify their contingency pricing. But pricing modifications will not be dictated to companies that have knowledge of the rates of a specific industry.

Responsibilities

"Terms and Conditions," "specifications," a "statement of work," and a "quality" plan will make clear who is responsible for what, and what our roles, responsibilities, and liabilities are for each project.

Qualifying a customer is important, and AWI will qualify its customers.

Giving budgetary quotes on a project does not necessarily convey commitment.

The agreement to do a job and the responsibilities for it are not set until the final terms are accepted.

Payments

Whenever possible, money up-front (e.g., for materials) and/or progress payments will be part of a contract. If the customer will not put in milestone or progress payments, then we will build the cost of money into our rates.

A “subcontractor” is different from a team player. If it is a Web project, and the customer does not pay the Web, there is no money to pay the participating companies. The Web has no assets; therefore, the team does not get paid until the Web gets paid.

Liabilities

The Web is not a shield from a financial or a liability standpoint; there is no hiding behind the web. If any one of us damages a product, he is responsible. Should such a situation arise, however, we will seek to cooperate and employ “teamwork”--like replacing materials at cost, etc.

In each contract, we will define how we are going to conduct business. If it is complex enough and there is enough money involved, we need to define liabilities in each specific Virtual Organization Contract (VOC), and also build this into our quality plan.

On a contract-by-contract basis there will be specific liabilities that will be defined.

Insurance

We will have AWI named as an "also insured" on our individual policies to cover our work with AWI, unless a project is outside the scope of what we normally do. If it is out of the participants' normal scope, AWI will obtain individual contract insurance for liability.

AWI will not seek to indemnify nor contractually commit to indirect or consequential damages.

Warranty

Warranty will be established on a project-by-project basis.

Workmanship warranty, individually backed by each participant, is part of the value that we have to present to the customer.

Within the Web, the president has authority to deal with problems, and beyond that there is arbitration.

Intellectual Property

All companies will continue to retain their own intellectual properties.

If a participating company or its employees create an invention that is not part of a contract or the statement of work, the intellectual property rights belong to the individual company.

But if the resources of AWI and the participating companies are used, and this collaboration is outlined in the statement of work, AWI and the participating companies will negotiate the intellectual property rights on a case-by-case basis.

Intellectual property created by employees of AWI is the property of AWI.

Quality

Quality Assurance Plans will be in place for each contract, and participating members will agree to comply as part of their participation.

Although AWI may suggest and facilitate internal improvement processes, it will not dictate such measures to the Agile Web companies.

Project Teams

The President has the authority to select teams, and (1) he will always have a rationale for decisions and (2) he will make all decisions in accordance with the AWI bylaws.

Only the President or his designated contact can make a commitment to a customer on behalf of AWI.

If the Web supplies an opportunity, then the project is Web business. For business not obtained through AWI, however, subbing out or turning it over to the Web President for management remains an individual company's prerogative.

There will be an expectation that if a company brings a contact to the Web, then that company will be a member of the project team if at all possible.

Participating companies will be careful not to circumvent the Web on Web-supplied opportunities, even if requested to do so by a customer.

Internal Etiquette and Communication:

Sharing information is essential.

A single point of contact is essential for effective project coordination and customer interface; therefore, full disclosure of the participating companies' contacts with the customer on each project is necessary.

The President or Project Manager will keep participants informed as necessary, *and* on a regular basis.

Our responsibility for communication receives the same priority that we place on communication in our own companies. If a company commits to participation in a project, it accepts full responsibility for proper and timely performance. Any reservations a company has to participating on a given project need to be communicated up front.

We will encourage line-to-line communications, and where necessary demonstrate a commitment to give authority at the engineer level.

To ensure employees are familiar with Web objectives and project status, Web company leaders will let their people know when a project will affect their workforce.

After drafting the Operating principles, the VOA team then took the document to the full Web, and secured the remaining companies' approval and their verbal commitment to these ideas. The next challenge, however, which Agile Web still faces is how to achieve a real commitment to these principles by the larger group. The VOA sub-team that developed the principles enjoyed a rich, bonding experience in moving through the detailed discussions. The rest of the membership was not so fortunate and, thus, has a considerable migration yet to undertake as compared to the team members. So, the challenge remains to make the rest of the group see the real-world application of these principles as they undertake specific web projects.

Conclusion

Moving the discussion of virtual-organization partnering away from abstract considerations toward a more tangible discussion of real-world scenarios made a drastic difference in getting at least a sub-group of the Agile Web to feel ownership of, and agreement with, a common set of operating principles. Although the resulting set of

principles is still short of the agile goal of having a pre-fashioned contract in place that can simply be rolled out and the blanks filled in for each customer opportunity, the operating principles do, nevertheless, represent a step forward. And using the Operating Principles as a guide, legal counsel will now be able to take the commitments conveyed therein and draft some boilerplate language to give Agile Web a head start in drafting the actual contracts for each specific job. Unlike traditional joint ventures, Agile Web will not be starting from scratch in drawing up a legal arrangement for each of its virtual organization agreements. While some work will now be required to come up with an appropriate job-specific virtual organization contract for each opportunity, the common vision that resulted from the development of the operating principles should prove worthwhile.

Appendix K

AGILE WEB POLICY MANUAL

Revised 18 July 1996

COMPANY DESCRIPTION

Agile Web, Inc. is a unique manufacturing organization that provides a wide range of high value manufacturing services related to electronic and mechanical assemblies and systems. It is a group of manufacturers with proven capabilities from eastern Pennsylvania that are united into a regional web of suppliers. Agile Web, Inc. forms itself around customer needs and conducts business as a single supplier. Quality, delivery and price are handled as functions of a single source supplier, with the customer benefiting from the experience of the multiple subcontractors forming Agile Web, Inc.

To ensure Agile Web, Inc. customers will receive a constant level of acceptable product quality, this quality manual is documented confirmation of their commitment to the quality system.

Agile Web, Inc. provides value-added design, production and service unlike any traditional supplier or supply chain. However, the quality processes, policies and procedures will be easily recognizable as those that are required for customers to succeed as leaders in their markets. The participating firms are recognized in their individual markets and industries as quality leaders. The achievements of these firms will benefit the customers who work with Agile Web, Inc.

A - MANAGEMENT RESPONSIBILITY

A-I. QUALITY POLICY

Quality, to Agile Web, Inc., means meeting or exceeding customer expectations.

Agile Web, Incorporated will constantly focus on ensuring the customer is always provided full value in product, service, and delivery.

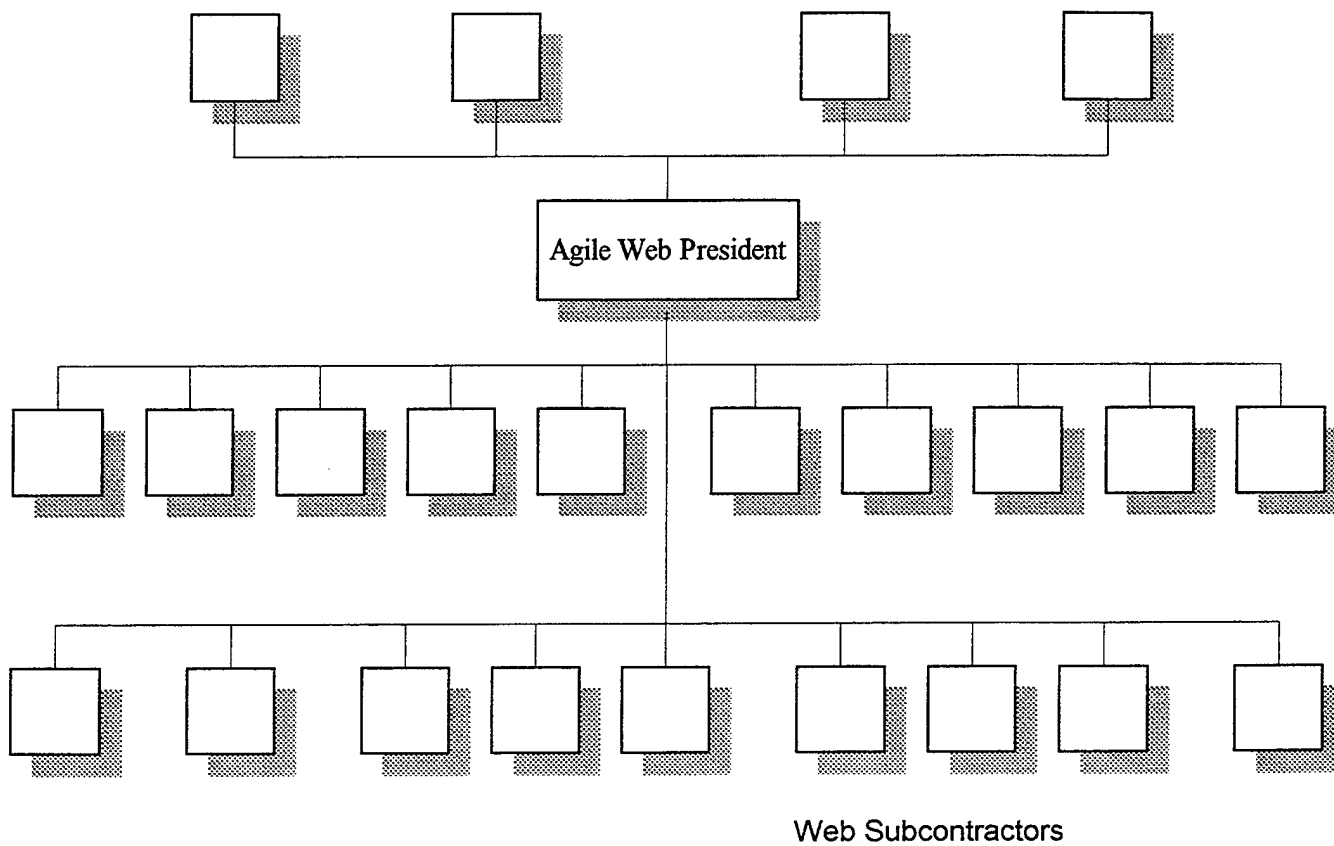
We will meet these objectives by having all Agile Web, Inc. subcontractors:

- Be responsible for continuous improvement
- Show total commitment to every project.
- Build on the unique strengths of each participant.
- Reflect to customers a singleness of purpose in order to satisfy the customer.
- Reinforce the quality image of Agile Web, Inc. on an employee by employee basis.
- Recognize Agile Web, Inc. is only as good as the individual participating supplier.
- Have a documented, implemented and maintained quality system.

A-II. ORGANIZATION

- a. Agile Web, Inc. elects a Board of Directors from members to provide overall direction and establish control policy.
- b. The Board of Directors will assign the president to be responsible for coordination and organization of Agile Web, Inc.'s virtual organizations. The Agile Web, Inc. president will also be responsible for the overall functioning of Agile Web, Inc.'s quality program including the implementation and maintenance of the ISO 9000 compatible quality system.
- c. The web president will coordinate the quality systems as each virtual organization is established. The individual subcontractors will align their quality activities to reflect a single-supplier quality strategy, thus providing to the customer, assurance that his product will always be of the highest quality.

Agile Web Board of Directors



A-IV. RESPONSIBILITY AND AUTHORITY

- a. Agile Web, Inc., within each contract, will define and document the responsibility, authority, and interrelation of personnel who manage, perform and verify work affecting quality, particularly for those personnel who need the organizational freedom and authority to:
 - 1. Initiate action to prevent the occurrence of any non-conformities relating to product, process and quality system.
 - 2. Identify and record any problems relating to the product, process and quality system.
 - 3. Initiate, recommend or provide solutions through designated channels.
 - 4. Verify the implementation of solutions
 - 5. Control further processing, delivery, or installation of non-conforming product until the deficiency or unsatisfactory condition has been corrected.

A-V. Agile Web, Inc. will identify resource requirements and contract for adequate resources, including the assignment of trained personnel, for management, performance of work, and verification activities.

A-VI. The Agile Web, Inc. president will have defined authority for:

- a. Ensuring that a quality system is established, implemented, and maintained for Agile Web Inc.
- b. Reporting on the performance of the quality system to the Board of Directors for review and as a basis for improvement of the quality system.
- c. Assigning the primary responsibility for insuring all the quality requirements and the coordination of meeting all quality specifications to a subcontractor organization for each contract.

A-VII. Agile Web, Inc's. president will review the overall efficacy of the quality system at defined intervals sufficient to ensure its continuing suitability and effectiveness in satisfying the Agile Web, Inc. stated quality policy and objectives. Records of these reviews will be kept by Agile Web Inc.

B-QUALITY SYSTEM

- B-I. Agile Web, Inc. will establish, document, and maintain a quality system as a means of ensuring that product conforms to specified requirements. The Agile Web, Inc. will prepare a quality manual covering the requirements of the quality system. This quality manual will include or make reference to the quality system procedures.
- B-II. An appropriate quality plan will be defined for the unique requirements of each contract.

C-CONTRACT REVIEW

- C-I. Agile Web, Inc. will establish and maintain documented procedures for contract review.
- C-II. Before the acceptance of a contract or order (statement of requirements), the contract or order will be reviewed by Agile Web, Inc. to ensure that:
 - a. The requirements are adequately defined and documented:
 - 1. Where no written statement of requirement is available for an order received by verbal means, Agile Web, Inc. shall ensure that the order requirements are agreed to before their acceptance.
 - b. Any differences between the contract or accepted order requirements and those in the bid for the contract are resolved.
 - c. Agile Web, Inc. has the capability to meet the contract or accepted order requirements.
- C-III. Agile Web, Inc. will identify how an amendment to a contract is made and correctly transferred to the Agile Web, Inc. and its sub-contractor.
- C-IV. Records of contract reviews will be kept.

D-DESIGN CONTROL

- D-I. Agile Web, Inc. will routinely assign any contractually agreed to design activities to an appropriate sub-contractor. The control of the quality of these assigned design activities will be the responsibility of the sub-contractor assigned.
- D-II. It shall be the assigned sub-contractor's responsibility to coordinate all design outputs with the customer.
- D-III. Agile Web, Inc. president shall be kept informed of the design activities progress by the assigned project manager.
- D-IV. The project manager shall be kept informed of the design activities progress by the design sub-contractor.

E-DOCUMENT AND DATA CONTROL

- E-I. Agile Web, Inc. president may assign a sub-contractor as the project manager for new and existing contracts, or the president will assume this role.
- E-II. When the Agile Web, Inc. president has designated a sub-contractor to be the project manager for a specific Agile Web, Inc. customer contract, the responsibility for document and data control will reside with the project manager but contract documents will be retained at Agile Web, Inc. after the completion of the contract.

F-PURCHASING

- F-I. Agile Web, Inc. will assign the responsibility for purchasing materials for a contract to the sub-contractors.
- F-II. The designated sub-contractor assigned to a specific contract will have the responsibility for assuring that appropriate subsuppliers are selected.

G-CONTROL OF CUSTOMER SUPPLIED PRODUCT

- G-I. Control of customer furnished product will be the responsibility of the sub-contractor utilizing such material. The individual sub-contractors will have appropriate procedures to cover the receipt, verification and methods for reporting any damaged or lost material to the project manager.

H-PRODUCT IDENTIFICATION AND TRACEABILITY

- H-I. If required by the contract or appropriate to the product manufacture, sub-contractors will maintain product identification and traceability. The assurance that this identification and traceability are included in the processing of the product will be the responsibility of the project manager.

I-PROCESS CONTROL

- I-I. The identification and planning of production, installation and servicing processes which directly affect quality will be the responsibility of the individual sub-contractors.

J-INSPECTION AND TESTING

- J-I. The verification that specified requirements for the product are met through appropriate inspection and testing activities will be the responsibility of the individual sub-contractors.
- J-II. The assurance that all required inspection and test activities have been completed for a specific contract will be the responsibility of the designated project manager.

K-CONTROL OF INSPECTION, MEASURING, AND TEST EQUIPMENT

- K-I. The control, calibration and maintenance of inspection, measuring and test equipment will be the responsibility of the individual sub-contractors.
- K-II. The responsibility for determining the measurements to be made and the accuracy required will be the responsibility of the sub-contractors as defined by the quality plan for the contract.

L-INSPECTION STATUS

- L-I. The means for the identification of inspection and test status will be determined and designated by the individual sub-contractors.
- L-II. The project manager, the web sub-contractor or web president, will be responsible for assuring that only product designated as conforming will be shipped to the customer.

M-CONTROL OF NONCONFORMING PRODUCT

- M-I. Individual sub-contractors shall be responsible to insure that product that does not conform to specified requirements is prevented from unintended use.
- M-II. The sub-contractor will notify other project team members to ensure that an approval system is in place prior to any rework being accomplished.

N-CORRECTIVE AND PREVENTIVE ACTION

- N-I Agile Web, Inc. will receive, analyze and assign the corrective action to the sub-contractor for customer complaints.
- N-II Corrective and preventive actions will be the responsibility of the individual sub-contractors.

O-HANDLING, STORAGE, PACKAGING, PRESERVATION, AND DELIVERY

- O-I Handling- storage, and preservation prior to final shipment to the customer, shall be the responsibility of the sub-contractors.
- O-II Packaging and delivery shall be the responsibility of the sub-contractors or shall be directed by the project manager if the packaging and delivery are covered as part of the contract.

P-CONTROL OF QUALITY RECORDS

- P-I Sub-contractors will keep quality records which are appropriate to demonstrate the proper functioning of their quality system.
- P-II Record retention times will be at the determination of the sub-contractors unless the specific contract has defined quality record retention. Then, the project manager will advise the involved sub-contractors of the contract's record retention requirements.

Q-INTERNAL QUALITY AUDITS

- Q-I Internal quality audits, as appropriate, will be the responsibility of the individual sub-contractors

- Q-II. The Agile Web, Inc. president or his designee may review the quality activities associated with any Agile Web, Inc. contracts.

R-TRAINING

- R-I. Training and the associated training-needs assessments will be the primary responsibility of the sub-contractors.
- R-II. The Agile Web, Inc. president may, at his determination, recommend specific training for sub-contractors.

S-SERVICING

- S-I. If and when servicing is part of the contract, the project manager will be responsible to insure the servicing is provided by a sub-contractor, if appropriate. This will include the supply of service parts.

T-STATISTICAL TECHNIQUES

- T-I. The use of statistical techniques will be at the determination of the individual sub-contractors and will be their responsibility.
- T-II. If a specific contract includes a requirement for statistical proof of conformance, the project manager will communicate this requirement to the appropriate sub-contractors and insure the proper statistical data is sent to the customer.

Quality Procedures Manual

1 January 1997

Management Review

AP1

Purpose:

- A) To insure the appropriateness and effectiveness of the Quality System in place at Agile Web, Inc.

Responsibility:

- A) The president of Agile Web, Inc. and the Board of Directors of Agile Web, Inc. will be responsible for establishing a management review meeting on the Quality System.
 - 1) This meeting will be held a minimum of annually and will include the president of Agile Web, Inc. and the Board of Directors of Agile Web, Inc.

Method:

- A) The president of Agile Web, Inc. will review the results of Agile Web, Inc. in the following areas of quality at a minimum:
 - 1) Customer satisfaction
 - 2) Results of the review of the Agile Web Quality System
 - 3) Corrective action request activity
- B) Records of this management review will be maintained. The records will include any corrective actions that are determined necessary based on the review of the quality system.

Quality System

BP1

Purpose/Scope:

- A) To establish a formal approach to the documentation of the Quality System description and associated quality activities within Agile Web, Inc.
- B) In any situation where the documentation for a procedure or process within a sub-contractor's area of control does not follow the Agile Web Inc.'s formal documentation practice or format, the sub-contractor's documentation methods and format shall be considered an acceptable alternative.

Responsibility:

- A) The president of Agile Web, Inc. will be responsible for ensuring any documentation for the Agile Web, Inc. Quality System. The practices and processes for the quality system will follow the formally documented practices for approval, issuance and control along with the use of any referenced documentation and/or forms.
- B) The individual sub-contractors involved in Agile Web, Inc. projects will be responsible for the establishment and documentation of their individual quality systems. These sub-contractors quality systems will not be required to conform to the Agile Web, Inc. Quality System description or format, but will be allowed to reflect each sub-contractor's unique approach to controlling their quality.

Method:

- A) Agile Web, Inc. will issue and control documented procedures that cover all phases of quality activities within Agile Web, Inc.
- B) Agile Web, Inc.'s Quality System documentation will be organized into three distinct levels of documentation.
 - 1) Quality Policy Manual
 - a) a high level document providing coverage of all 18 clauses of ISO-9002.
 - 2) Quality Procedure Manual
 - a) a working level document providing the method and accountability of a practice or process.
 - 3) Quality Work Instructions Manual
 - a) a descriptive operative focused documentation of how a practice or task is to be completed. In certain instances the Procedure Manual will also include all the information on how to do a particular task.
- C) Agile Web, Inc.'s documentation will contain the following information:
 - 1) Author/person responsible

- a) this is the person who has the responsibility for the particular process or task that is described in the procedure or work instruction
- 2) Date of issue
 - a) the date the documentation became an official issue.
- 3) Approval
 - a) the signature of the president of Agile Web, Inc. indicating approval for inclusion in the Agile Web, Inc. Quality System documentation.
- 4) Purpose/Scope
 - a) the reason for the documentation's existence and any limitations for the documentation.
- 5) Responsibility
 - a) the person/persons charged with ensuring the described practice and/or process is incorporated and followed within Agile Web, Inc.
- 6) Method used to achieve system element requirements
 - a) the method will include the who, where, when, what and how of the practice or process being described in the documentation.
 - b) in some instances the "how" of the method may be described in a separate work instruction. In these instances the work instruction will be appropriately referenced in the procedure.
- 7) References (optional)
 - a) this will identify any documents or forms that are associated with the documentation of this element of the quality system.
- 8) Records (optional)
 - a) this will identify any records that are to be kept to indicate proper and on-going following of the documentation procedure.
- D) Agile Web, Inc. form (AWI-001) will be the standard form used when documenting Agile Web, Inc. procedures or work instructions.

Contract Review

CP1

Purpose:

- A) To insure all contracts or orders received by Agile Web, Inc. are reviewed for adequate and acceptable information in order that a determination can be made by Agile Web, Inc. if it can meet the customer's requirements as described in the contract or order.

Responsibility:

- A) Contract review will be initiated by the president of Agile Web, Inc. or he may elect to delegate the responsibility for contract review to an appropriate sub-contractor.
- B) When and if, the president determines the contract is to be sub-contracted and the sub-contract agreement includes responsibility for contract review, the sub-contractor's project manager will be responsible for a complete and thorough review of the contract or order, and the transfer of contract requirements to any other chosen sub-contractors for review and agreement.

Method:

- A) The president of Agile Web, Inc. or the project manager will ensure there is a clear understanding of the customer's contract requirements and that these requirements are communicated to all sub-contractors involved in the project covered by the contract.
- B) The president of Agile Web, Inc. or the project manager is responsible for contacting each sub-contractor involved in the project to verify agreement and acceptance of the customer's contract prior to conveying agreement to the customer.
- C) If the contract is a verbal communication, the president of Agile Web, Inc., or the project manager will document the verbal customer requirements to insure understanding and agreement.
- D) The president of Agile Web, Inc. or the project manager will define with each customer how contract amendments will be made and from whom in the customer's organization amendments to a contract will be accepted.
 - 1) if Agile Web, Inc. wants to amend a contract, the president of Agile Web, Inc. or the project manager will be the only authorized representatives of Agile Web, Inc. to contact the customer's representative.
 - 2) if a sub-contractor other than the project manager wishes to request a contract amendment, the sub-contractor must contact the president of Agile Web, Inc. or the project manager,

depending on how the project is being administered, and request that a contract change/amendment be requested of the customer.

- E) In all cases records of contract review will be kept.
 - 1) if contract review is handled by a project manager, at the completion of the project, the contract review documentation and any contract amendments are to be forwarded to the president of Agile Web, Inc. for inclusion in the historical quality records of that project.

Design Control

DP-1

Purpose:

- A) To ensure proper control of any design activities contracted to by Agile Web, Inc. Agile Web, Inc. will sub-contract any design activities.

Responsibility:

- A) The acceptance of design responsibilities and the subsequent sub-contracting of these activities will be the responsibility of the president of Agile Web, Inc. or a designated project manager.

Method:

- A) The president of AWI or the designated project manager initially ensures the competency of the selected sub-contractor to perform the design activities.
- B) The selected design sub-contractor submits a design activity plan to the president of AWI or the project manager. This plan contains some or all of the following:
 - 1) design input requirements statement.
 - 2) design output statement expressed in appropriate units.
 - 3) design review results at appropriate stages of the design activities
 - 4) design verification activities and results including the recording of verification meetings
 - 5) design validation methods and acceptance criteria.
 - 6) design change identification, review, documentation and method of approval.
- C) The sub-contractor responsible for design provides progress reports to the president of AWI or the project manager.
- D) If a project manager is responsible for the design sub-contractor, the project manager will keep the president of AWI informed of the progress of the design activities.
- E) All design designated requirements are communicated to the design sub-contractor through the statement of work and the customer furnished specifications in the form of design input. This information is supplied to the design sub-contractor by Agile Web, Inc.

Document and Data Control

EP-1

Purpose:

- A) To ensure any user of AWI quality documentation and/or data has assurance that the appropriate revision of the documentation is what the user has available or there is a formal system that is available, to the user, to verify the appropriate documentation revision.

Responsibility:

- A) The responsibility for documentation and data control is divided into two categories: Agile Web, Inc. direct responsibility and sub-contractor direct responsibility. The determination of responsibility is based on the responsibility for contract administration and the responsibility for product quality.

Method:

- A) When the president of AWI or a designated project manager functions as the contract administrator, the responsibility for documentation issue, approval and control including any associated documentation changes, is under the direct control of the contract administrator for the AWI controlled documents and/or data.
 - 1) this control includes maintenance of a master list or master data file of all controlled documents.
 - 2) this control includes the supply and maintenance of customer supplied documentation to appropriate sub-contractors
- B) Sub-contractors that are part of the virtual organization have the responsibility to ensure appropriate AWI documentation is distributed and controlled within their organizations and to their suppliers as required.
 - 1) this control and maintenance includes the removal and replacement of any AWI documentation that has had a revision supplied to the sub-contractor by AWI.
 - 2) the sub-contractor's documentation review procedure ensures any new or changed documentation is reviewed prior to the changes or modifications dictated by the new or changed documentation being incorporated into the sub-contractor's quality system and quality planning.
- C) When documentation has been revised or superseded by a new document and the replaced document must be retained by AWI or the sub-contractor for historical reference. This documentation is to be removed from the active files and placed into an historical file and identified as such.

Purchasing FP-1

Purpose:

- A) To ensure acceptable purchasing processes are used to procure materials used by Agile Web, Inc. in order to supply customer acceptable product to the customer.

Responsibility:

- A) The purchasing function is divided into two separate and distinct areas of responsibility.
 - 1) Agile Web, Inc. and its president or his designee has specific purchasing responsibilities, particularly in the areas of sub-contractor selection and purchasing data.
 - 2) Sub-contractors to Agile Web, Inc. have specific purchasing responsibilities, particularly in the area of material and service suppliers and purchasing data.

Method:

- A) The president of Agile Web, Inc. or his designee shall make the decisions as to who shall be selected as the sub-contractors, forming the virtual organization.
 - 1) the initial selection criteria for sub-contractors to form the virtual organization is
 - a) the approved supplier list, which at a minimum will include the Agile Web, Inc. shareholders who have agreed to the operating principles and have had their core competencies reviewed and approved.
 - 2) the secondary selection criteria is the ability of the sub-contractor to provide a competency not available within the pre-qualified sub-contractors. Quality, delivery and price are also evaluated to determine the sub-contractors acceptability.
 - 3) the president of Agile Web, Inc. or his designee will determine what purchasing data will be sent to each sub-contractor and ensure the correctness of the data prior to submission to the sub-contractor.
 - 4) any sub-contractor that is approved for use in the secondary selection process is added to the Agile Web, Inc. approved sub-contractor listing. This approved sub-contractor listing will be kept as a separate grouping from the 18 pre-qualified sub-contractors.
- B) Sub-contractors forming the virtual organization will have the authority responsibility for selection of their suppliers of materials and services.
 - 1) each Agile Web, Inc. sub-contractor has a process to select their suppliers; a major area in the supplier selection process is the supplier's ability to supply a quality product or service.

- 2) each Agile Web, Inc. sub-contractor has a listing of approved suppliers; this listing contains the 18 pre-qualified Agile Web, Inc. sub-contractors and they are designated as preferred suppliers.
- 3) each Agile Web, Inc. sub-contractor has a process to ensure all purchasing data sent to their suppliers is complete and accurate. This process includes the review of the purchasing data prior to transmittal to the supplier.
- C) Approved sub-contractors are reviewed on a regular basis by a designee of Agile Web to ensure their quality is still acceptable to Agile Web, Inc.
 - 1) if an approved sub-contractor's quality level deteriorates to an unacceptable level, the sub-contractor will be removed from the approved list and will be required to undergo a complete re-approval verification.
- D) Sub-contractors have procedures in place to ensure that any of their suppliers whose quality deteriorates below an acceptable level, will be removed from the approved supplier listing and will be required to be re-approved prior to furnishing any future product or service.

Control of Customer Supplied Product

GP-1

Purpose:

- A) To ensure the control of customer supplied product is properly done and appropriately documented.

Responsibility:

- A) The president of Agile Web, Inc. or the designated project manager will notify the affected sub-contractor of the inclusion of the condition of customer supplied product in the statement of work.
- B) Agile Web, Inc. sub-contractors are responsible for controlling customer supplied product which includes documentation of the processes used to ensure this control.

Method:

- A) Each sub-contractor has a unique method for the control of customer supplied product. This method is described in the sub-contractor's quality system description.

Product Identification and Traceability

HP-1

Purpose:

- A) To ensure identification and/or traceability of product is accomplished by a formalized method if required by a customer or if appropriate to the product's manufacturing process.

Responsibility:

- A) The president of Agile Web, Inc. or the designated project manager will inform the appropriate sub-contractor(s) of the requirement for product identification and/or traceability by inclusion of the requirement in the product specification and statement of work.
- B) The individual sub-contractors are responsible for ensuring that product identification and/or product traceability is accomplished based on the contract requirements.

Method:

- A) Each sub-contractor has a unique method for ensuring product identification and/or product traceability. This method is described in the sub-contractor's quality system description.

Process Control

IP-1

Purpose:

- A) To ensure appropriate process controls are in place and document on-going control of product quality processes.

Responsibility:

- A) Sub-contractors to Agile Web, Inc. have process controls designed and defined in their quality system description. These controls are based on the specifications and statement of work supplied by Agile Web, Inc. as part of the sub-contract agreement.

Method:

- A) Each sub-contractor to Agile Web, Inc. has designed and documented a process control system that is unique to that particular sub-contractor.
- B) Each sub-contractor has designed, implemented and continues to maintain their quality system as a means to ensure on-going process control to meet the Agile Web, Inc. sub-contract quality requirements.

Inspection and Testing

JP-1

Purpose:

- A) To ensure the verification of all inspection and testing requirements that ensure product quality and are part of the Product Quality Plan are properly completed.

Responsibility:

- A) The responsibility for ensuring all inspection and testing requirements are met includes:
 - 1) the overall responsibility for ensuring all inspection and testing is designed, implemented and maintained is under the direct control of the virtual enterprise resource team and is subject to review by the president of Agile Web, Inc. or the designated project manager.
 - 2) the inspection and testing required by the Product Quality Assurance Plan and implemented and maintained at the sub-contractor level, is the responsibility of the individual sub-contractor organization.

Method:

- A) The total product inspection and testing plan for each project is designed by the Virtual Enterprise Project Resource Team.
 - 1) the Quality Assurance Plan is a part of the VOA.
- B) The individual sub-contractors design and implement their inspection and testing plans based on the program plan, Quality Assurance Plan and any supplements that are necessary in their operations to ensure product quality.

Control of Inspection Measuring and Test Equipment

KP-1

Purpose:

- A) To ensure all inspection, measuring and test equipment used in the control and acceptance of product to customer specifications is controlled, calibrated and maintained.

Responsibility:

- A) The individual sub-contractors have suitable procedures in place to ensure the control, calibration and maintenance of inspection, measuring and test equipment.

Method:

- A) The resource team includes as part of the program plan, the quality assurance plan. Within the Quality Assurance Plan is the delegation of responsibility for controlling, calibrating and maintaining all inspection, measuring and test equipment used to control and verify product to customer specifications.

Inspection and Test Status

LP-1

Purpose:

- A) To ensure the identification of inspection and test status is determined and designated on product as it is processed.

Responsibility:

- A) The responsibility for the identification of inspection and test status is included in the controls assigned to the individual sub-contractors by the Project Quality Assurance Plan.

Method:

- A) The resource team includes as part of the Quality Assurance Plan, the requirement for the identification of inspection and test status by each sub-contractor.
- B) Each sub-contractor includes Quality Assurance Plan methodology to identify inspection and test status of product under their control.

Control of Non-Conforming Product

MP-1

Purpose:

- A) To ensure that product that does not conform to specified requirements is identified, documented, evaluated, segregated and appropriately handled.

Responsibility:

- A) The responsibility for control of non-conforming product is divided between president, Agile Web, Inc. or the designated project manager and the involved sub-contractor.
- B) Primary responsibility for identification, documentation and segregation resides with the sub-contractor.
- C) The president, Agile Web, Inc. or the designated project manager is responsible for the verification of acceptance by the customer of any non conforming product corrections made by the sub-contractor.

Method:

- A) Within each sub-contractor's quality assurance plan is a documented procedure that explains the internal handling of non-conforming product. Each sub-contractor has a standard practice unique to that sub-contractor for handling non-conforming product.
- B) The resource team includes in the Product Quality Assurance Plan, a requirement that any non-conforming material corrective action that alters the product or has the potential of altering the product's meeting specification, must be submitted to the president of Agile Web, Inc. or the designated project manager prior to the execution of the corrective action.
- C) The president of Agile Web, Inc. or the designated project manager will, when notified by a sub-contractor of a corrective action proposal for product correction, contact the customer to verify the acceptability of the corrective action and request agreement from the customer. The involved sub-contractor will be notified of the customer's decision.

Corrective & Preventive Action

NP-1

Purpose:

- A) To ensure an effective and efficient system to handle corrective and preventive action is implemented and maintained by Agile Web, Inc.

Responsibility:

- A) The responsibility for corrective and preventive action is divided into two distinct areas of responsibility
- B) The first area of responsibility resides at the Agile Web, Inc.
 - 1. this responsibility covers all areas associated with customer quality at both the initial receipt of Agile Web, Inc. supplied product and at the subsequent use of the product.
- C) The second area of responsibility resides at the sub-contractor's processes. This area also covers the sub-contractor to sub-contractor corrective and preventive actions.

Method:

- A) The president of Agile Web, Inc. will receive and review all customer quality complaints. If the customer project was handled by a project coordinator, the project coordinator will be supplied with the customer complaint information and be given the responsibility to initiate corrective action.
 - 1) all customer quality complaints will be documented on a Quality Assurance Problem Report form (AWF-1). This report shall contain all available information from the customer quality problem.
 - 2) the quality assurance problem reports have a unique identification number. This number reflects the year, day of the year and the numerical sequence of that report for that day.
 - a) example:
a quality problem reported to Agile Web, Inc. on September 4, 1996 and the first complaint for that day will be identified as 96-249-1.
- B) If after a review of the customer complaint and a review of the Agile Web, Inc. sub-contractor responsibility assignments and specifications, the determination is made by the president of Agile Web, Inc. or the project manager that sub-contractor corrective action is required, a corrective action request (AWI-02) is to be issued to the sub-contractor with parts A&B completed by the issuer.
 - 1) the corrective action request number shall be a duplication of the problem report number with the addition of an alpha character at

the end of the number 96-249-1A starting with "A" and proceeding down the alphabet if multiple corrective action reports for the same problem are issued.

- a) example:
96-249-1A is the first corrective action request issued to a sub-contractor for that particular problem report.
- 2) sub-contractors have the authority to use their internal corrective action request forms for any internal corrective actions they deem necessary and for any of their supplier corrective action requests. The corrective action requests issued by individual sub-contractors to other Agile Web sub-contractors will have a copy forwarded to the president of Agile Web, Inc.
- C) Upon the receipt of a request for corrective action from either the president of Agile Web, Inc. or the project manager, the sub-contractor will diligently pursue activities that are designed to resolve the corrective action request. The corrective action reports will be returned to AWI.
 - 1) if the corrective action process appears to be lengthy, the sub-contractor will provide the requester with progress updates.
- D) Preventive actions are documented and reported in the same manner as corrective actions using the standard corrective action request form with the following exception:
 - 1) identification of formal preventive action will use an identifier in the corrective action request number, this identifier is a P.A. prefix regardless of any other code.
 - a) example of a preventive action request issued by the president of Agile Web, Inc. would be P.A. 96-254-1 for a preventive action request issued September 10, 1996.
- E) A master listing of all corrective action requests and preventive action requests issued by the president of Agile Web, Inc. or a project coordinator is maintained in the administrative office of Agile Web, Inc.

Handling, Storage, Packaging, Presentation and Delivery

OP-1

Purpose:

- A) To ensure handling, storage, packaging, presentation and delivery are performed to customer requirements and standardized practice.

Responsibility:

- A) Primary responsibility for ensuring handling, storage, packaging presentation and delivery are accomplished in an acceptable manner, which conforms to documented procedures, resides with the individual sub-contractors
- B) The president of Agile Web, Inc. or the designated project manager is responsible to ensure any unique requirements for handling, storage, packaging, presentation or delivery is included in the statement of work, the product specifications, and/or the product quality plan as appropriate.

Method:

- A) All sub-contractors have appropriate documented process practices in place to ensure handling, storage, packaging, presentation of product is accomplished while the product is under their control.
- B) The sub-contractor ensures any special contractual requirements for handling, storage, packaging, presentation or delivery conveyed to him in a statement of work, product specifications or product quality plan is accomplished as required.

Control of Quality Records

PP-1

Purpose:

- A) To ensure quality records that demonstrate the proper functioning of the quality system and product conformance to specifications are collected, identified and stored properly.

Responsibility:

- A) The responsibility for control of quality records is divided into two separate categories:
 - 1) the president of Agile Web, Inc. or the designated project manager is responsible to ensure all quality records generated by all sub-contractors, that confirm conformance to specifications are submitted by the individual sub-contractors to whomever is coordinating the project for inclusion in the project's historical records.
 - 2) the individual sub-contractors have quality record retention programs and it is the individual sub-contractor who compiles, identifies and stores their quality records associated with the production of Agile Web products.

Method:

- A) The president of Agile Web, Inc. or the designated project manager has the responsibility for informing the virtual enterprise project resource team of the need for sub-contractors to supply quality records demonstrating product conformance. The need is included in the Project Quality Assurance Plan.
- B) The individual sub-contractors establish, complete and retain quality records of the areas and/or activities that they determine are necessary to ensure process control within their facility.
- C) The individual sub-contractor allows representatives of Agile Web, Inc. access to quality records for any Agile Web, Inc. project the sub-contractor participated in, provided there is adequate notice, of the Agile Web, Inc. representative's intention to review the quality records and the quality records requested for review are directly related to the Agile Web, Inc. project specified by the Agile Web, Inc. representative.

Internal Quality Audits

QP-1

Purpose:

- A) To ensure quality activities are monitored to determine conformance with the documented quality system.

Responsibility:

- A) The president of Agile Web, Inc. is responsible for internal audits of the portions of the Agile Web Quality System that fall under their direct control.
- B) Sub-contractors are responsible for the monitoring of their documented quality system through the use of internal audits.
- C) The president of Agile Web, Inc. has the authority to review any sub-contractor's quality activities associated with any Agile Web, Inc. project.

Method:

- A) The president of Agile Web, Inc. engages an organization to perform internal audits of the quality system elements that the president of Agile Web, Inc. is directly responsible for.
 - 1) the internal auditors engaged by Agile Web, Inc. will follow routine and practices for internal auditing which includes, but are not limited to:
 - a) non-conformity reporting
 - b) corrective action requests
 - c) audit summary reports
- B) Sub-contractors accomplish internal audits of their quality systems by utilizing their internal auditing trained staff members or by engaging trained auditors from outside their organization.
- C) Sub-contractor's documented internal audit practice ensures that internal auditors are not under the direct control of those having responsibility for the area being audited.
- D) The president of Agile Web, Inc. or the designated project manager may choose to review a sub-contractor's quality activities associated with any Agile Web, Inc. contract.
 - 1) these reviews are not to be considered internal audits by the sub-contractor, but rather a customer audit.
 - 2) any non-conformities determined to exist during those reviews are considered customer noted quality system non-conformities and require appropriate corrective action.

Training

RP-1

Purpose:

- A) To ensure the assessment of training needs and any needed training are conducted based on documented practices.

Responsibility:

- A) Sub-contractors are responsible for the assessment of training needs of employees and the subsequent addressing of those needs.

Methods:

- A) Each sub-contractor has their individual methods for analyzing training needs and for addressing any noted training needs.
- B) The quality plan for each project addresses the need for experienced trained employees within a sub-contractor's operation.
 - 1) the responsibility for ensuring this requirement is met resides with the sub-contractor.

Servicing

SP-1

Purpose:

- A) To ensure if and when servicing is part of an Agile Web, Inc. project, the servicing is performed under appropriately documented procedures.

Responsibility:

- A) The president of Agile Web, Inc. or the designated project manager ensures the requirement for product servicing, if required by the customer, is included by the resource team in the statement of work.
- B) Sub-contractors, whose statement of work includes product servicing, have documented procedures to provide the specified servicing.

Method:

- A) The president of Agile Web, Inc. or the designated project manager informs the resource team and verifies that the requirement for product servicing is included in the appropriate sub-contractor's statement of work.
- B) Sub-contractors, who receive a statement of work requiring product servicing, have procedures for product servicing included in their quality system description.

Statistical Techniques

TP-1

Purpose:

- A) To ensure that appropriate statistical techniques are applied to product processes, if and when needed, either to “ensure” process control or if customer specified.

Responsibility:

- A) The sub-contractor has procedures in place to ensure appropriate statistical techniques are applied to product processing in the following situations:
 - 1) the customer of Agile Web, Inc. has included, in the purchase order, the requirement for supplying statistical proof of product conformance:
 - a) this requirement will be transmitted to the sub-contractor via the statement of work and/or the project quality plan.
 - 2) the sub-contractor has evaluated the appropriateness of using statistical techniques to control their processes and has determined the use of statistical techniques appropriate.
 - a) the sub-contractor incorporates into his product processing those statistical techniques appropriate to his processes.

Appendix L

“Coordinating Quality in the Agile Web”

Not so long ago, “quality” transcended the status of mere buzzword. Talk of its importance in manufacturing and hype about yet another quality-improvement system or process seemed absolutely ubiquitous. Indeed “Quality Improvement” could rightly have been deemed a “movement” in American business, as manufacturing companies sought any and all weapons to counter the onslaught of Japanese competition in the electronic, automobile, and computer industries. Now, however, quality has not so much disappeared as it has simply assumed the status of an unspoken and essential prerequisite for doing business. Despite talk of the pros and cons of the various ISO 9000 series and other registrations, as well as the evolution and/or elimination of the Mil standards, no one can question the permanency of quality *systems* themselves. Thus the assumption holds that without a quality system in place, business will soon be leaving if it is not gone already.¹

That having been said, the issue of quality does present some new challenges when faced in the context of agile collaboration. As a first step to address the matter of coordinating quality in the Agile Web, the Ben Franklin support team developed a customer survey to start looking at some of the issues to be encountered by virtual companies. Designed to find what special quality concerns might arise as a consequence of involving more than one company, the survey asked for customer feedback on several issues, including their preferences for ISO 9000 or MIL standards

¹ See, for example, Joseph M. Juran, “Made in U.S.A.: A Renaissance in Quality,” *Harvard Business Review* (July/August 1993): 42-50.

and their timetable for requiring registration by their suppliers. The questionnaire also asked about their desires for partnering with suppliers and what they envisioned will be required to make such interaction work.

Of the nine customers surveyed, most responded that they wanted to see ISO registration within seven years, and *all* were looking for compliance in the absence of actual registration.² The majority also considered partnering with suppliers important in order that suppliers could become more responsible for meeting their quality needs. As for special requirements in dealing with a web-type organization, they desired to see the web provide a single point of contact to both manage and be responsible for assuring quality and delivery.

Moving forward from the preliminary survey, more thought was given to customer quality requirements in the marketplace. When assessing how the Agile Web could market its quality, it became apparent that the overall quality of the Agile Web is limited to the weakest link on any given production team. That is, once quality is compromised at any point, the overall quality of the final product is affected. Therefore, raising all of the companies to some minimum level of quality became imperative.

In order to evaluate the current state of quality systems existing in the Agile Web companies, the BFTC team employed a consultant to review the individual companies' manuals and to install an assessment software package at each site. This package

² It is interesting, and indicative of the ongoing ambivalence surrounding the ISO system, that despite wanting to see registration by their suppliers, the majority of customers themselves used their own internally-developed quality systems.

provided a tool that can be used by the individual companies to conduct an evaluation of their performance in each of the ISO 9000's nineteen quality categories. This is a tool that can be applied by firms to assess their compliance and to measure their improvements over time. However, the Agile Web had a more immediate need which was to understand the strengths of its quality system in critical areas and to identify areas of improvement that could be addressed to ensure success for Agile Web projects.³ Targeting both weak spots and the most fundamental ISO 9000 areas, Agile Web Inc. then agreed to focus on ten of the nineteen ISO 9000 areas. Having agreed on these ten core areas, the Web's next step was to have a consultant assess these areas and begin to move each of the participating companies to an interim level on the way to full ISO 9000 compliance.

"Improvement Project" Preliminary ISO 9000 level

One of the obstacles to coordinating quality among a group of eighteen or nineteen firms is the delicate matter of asking the group to commit resources in the absence of production orders that are actually demanding, and rewarding, those systems at the moment. One of the ways of trying to overcome such a hurdle has been to capitalize on the momentum toward quality improvement in the individual companies that is being driven by each AWI company's current customer base, outside of Agile Web. Such customer pressure has been valuable in achieving a collective recognition of the need for continuing quality improvement, but with different customers employing different

³ Each company, working with the consultant, also outlined action plans to address deficiencies in *all* nineteen areas. The ten core areas, however, were considered the most fundamental and, thus, pressing for Agile Web, Inc.'s joint functioning.

systems it has also made convergence to a single system for the eighteen companies nearly impossible.

As noted above, the problems one would expect in coordinating the systems of many different companies have only been compounded by the lack of a single recognized standard, as well as the absence of a universally recognized auditing system. Consequently, small companies with limited resources--and for that matter, even big ones--are reluctant to devote time and resources, never mind the considerable registration fees, in pursuit of a single standard's registration. Sensitive to such constraints, Agile Web enacted a process to improve ten "core" areas of the ISO 9000 standard. They consisted of: responsibility and authority, quality system, contract review, document control, purchasing, process control, calibration, non-conforming product, corrective action, and training. This proved an effective way to get the companies to think about how their systems might best overlap and dovetail with each other's on joint projects. Measured in terms of actually moving the eighteen firms into one integrated system, however, progress was somewhat slow.

Dealing with Quality in Pursuit of customers:

So, in light of the difficulties inherent in converging eighteen companies to one standard, the emphasis has shifted instead to preparing for quality requirements that customers are likely to demand on immediate production projects. That is, AWI has moved away from a more abstract approach, which sought to meet all contingencies, toward a more *ad hoc*, opportunity-specific approach to quality. The overall

improvement plan now is based on the belief that the optimal Web mode of integration will evolve in response to a series of customer demands and requirements.

In coming together to work on a joint project, there appear to be two levels at which quality in such a grouping of companies needs to be addressed: the AWI level and the individual firm level. The overall improvement process aspect, which addresses the overall migration of the firms toward a desirable standard, has been left to each of the individual firms. The issue of coordinating the quality systems on a given joint production project remains, however, and it has presented some novel challenges.

AWI began to tackle this issue by dividing the overall quality system into the standard policy and procedures aspects. Accordingly, a policy manual was developed to provide an overview of the quality issues to be addressed in the AWI system. A procedures manual is also being developed to address how quality procedures will be implemented both at the overarching web level and, for more specific production-related matters, at the level of the individual companies. The procedures manual makes it clear that in cases where activities are not under the purview of AWI, the quality system of AWI then "hands off" to the quality systems prevailing at each of the Web companies. In this way it provides coordination and traceability of all AWI's activities.

Among the most important issues to arise in bringing different companies together have been:

- Coordinating activity and maintaining accountability in the interstices of collaborating organizations.

- Avoiding redundancies (e.g. inspection of outgoing then incoming parts) in order to fully integrate on a level necessary to compete with the speed and efficiency that a single unified organization can achieve.
- Deciding who has overall authority for Quality in Agile Web Projects. For example, there are different models of Agile Web projects. One has the AWI and its president clearly in the lead role, while other approaches are designed to have individual companies providing coordination and customer interface, etc.

As it now stands, AWI hopes to address these issues in each contract through a clear delineation of roles in the statement of work and quality plan that will govern each joint-production project. One special challenge facing Agile Web as a government pilot project is that once its support ends, AWI will not have the overhead resources to move beyond what even the most basic manufacturing rep can provide. Hence, coordination and oversight of improvements at the individual company level have to be undertaken through the resources of that company. But the question of what services AWI can actually provide drives at the more fundamental issue of how AWI operates in the marketplace. Is in fact AWI a true single-source supplier, or is it just a marketing rep? To be the former, it has to have definite oversight and accountability procedures regarding quality in the constituent firms. The team recognized that AWI also had to be careful as to not overstate its claims regarding the level of activity that it actually performs, lest it get tripped up in a quality audit and cause severe damage to its reputation.

To address these accountability and traceability issues, the BFTC team recognized that two levels had to be addressed, with the bulk of Agile Web Inc.'s purview and authority coming in at the coordinating level, governed by the AWI system outright, and the operational issues taking place at the individual company level, coordinated by making sure that quality procedures are traceable to activities at the operational level. Traceability is ensured by making sure that quality procedures in AWI, per se, link seamlessly to the individual quality systems of the eighteen Agile Web companies. Thus, it remains those individual quality systems of the AWI participating companies that provide the bulk of Agile Web Inc.'s overall quality.

Policy Manual

Reflective of the ISO 9000 format, the AWI Policy manual expresses AWI's commitment to the delivery of quality and the maintenance and ongoing improvement of quality processes. It provides an overview of the management structure, and indicates that the President of AWI serves as the chief quality coordinator. The manual delineates the lines of authority and accountability. It outlines the policy for contract review at the AWI level and describes the lines of responsibility for overseeing design activities. It defines responsibility for document and data control, purchasing, control of customer-supplied product, product identification and traceability, process control, and inspection and testing. It also lays out responsibility for control of non-conforming product, corrective and preventive action, and handling, storage, packaging, preservation and delivery policies. Finally, the policy manual sets out responsibilities for internal quality audits, control of quality records, and training, servicing, and statistical techniques.

Procedures Manual

While the Policy Manual deals with authority and responsibility at the high level of AWI, the procedures manual being developed will more specifically delineate the methods needed to fulfill in practice the commitment to quality demanded in each of the areas cited above. Essentially, the manual accomplishes this by providing traceability from the level of AWI into the quality procedures taking place at the production level in each of the eighteen companies.

Other Challenges

The problems encountered in achieving quality coordination and integration among a constellation of companies in an agile web also beg larger questions for other quality initiatives. Continuous improvement processes present one such challenge that will be demanded of such groups if they are in fact going to be able to compete with larger, fully-integrated organizations. The specifics of these matters as they arise in actual production projects and AWI's responses to these issues remain to be assessed as AWI gears up to meet the challenges of its pending customer opportunities.

Press Releases Generated by Schaeffer and Associates

Eastern Pennsylvania Companies Form Unique Corporate Entity
To Provide New Approach to "Agile" Manufacturing

BETHLEHEM, PA –The Ben Franklin Technology Center at Lehigh University has announced the formation of Agile Web, Inc., a unique new corporation formed by 19 small to medium-sized companies in eastern Pennsylvania.

The company has been established with the express purpose of providing a new form of integrated supplier-chain applying the techniques of agility for fast-response product design and manufacturing.

Agility, which has been hailed as the new approach to manufacturing in the 21st century, has come into widespread practice among large companies confronting growing demand for customized output as opposed to mass production.

According to officials at Ben.Franklin Technology Center, Agile Web is unique in that it

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brings together a group of highly experienced entrepreneurs who have successfully built individual companies to unleash their combined inventiveness on behalf of customers with constantly changing needs for customized solutions in fast-response product design and manufacturing.

A key feature of the Agile Web concept is its flexibility; in effect, it reconfigures itself by selecting from among member companies' capabilities to meet the precise needs of each customer.

In market research studies, the concept was shown to be particularly appealing to companies engaged in widespread new product development, where there is a pressing need for outside sources with diversified capabilities in product-design and prototype production. The Web will also work with customers who want resupply or new parts where they have already done the design work.

Potential customers for Agile Web services include large diversified manufacturers, mid-cap companies either in expansion or outsourcing modes, and startup companies which may have limited or no production facilities.

In particular, Agile Web, Inc.'s capabilities are well suited to serving the defense sector,

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where there is a pressing need to maintain a supplier base to provide for rapid production of spare parts and supplies as well as support large prime contractors in fulfilling demanding new systems requirements.

Named to head Agile Web, Inc. is Ted Y. Nickel, a former IBM executive who was part of the team that developed the initial concept of agility in manufacturing. As CEO, Nickel will direct all facets of Agile Web's introduction and project management, with support from the Ben Franklin Technology Center staff and individual companies in the Web. Nickel reports to a five-person board of directors made up of executives from member companies and the Ben Franklin Technology Center staff. Ownership of the new corporation is divided equally among the member companies.

Nickel said he expects Agile Web to establish a prototype for how small companies can productively apply the concept of agility, as defined in a landmark study by the Iacocca Institute, also located at Lehigh University.

That study, which included participation by a panel of industrialists seeking to determine how U.S. manufacturers can compete effectively, developed the concept of agility as an approach to capitalize on a trend toward customization in product development.

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According to Dr. Roger Nagel, one of the developers of the agility concept and now executive director of the Iacocca Institute, the agile corporation recognizes the desirability of maximum flexibility in seeking new ways to anticipate and respond to the needs of customers, functioning more as a business partner in developing solutions than as simply a supplier.

In addition to agility, the formation of Agile Web, Inc. is an outgrowth of the trend among purchasers toward consolidating supplier chains. It is believed that Agile Web, Inc. can establish a new model of business practices among small and medium-sized manufacturers seeking to compete effectively in an era of consolidation of suppliers and customization in production.

Increasingly, large contractors have sought to reduce the number of single-task subcontractors in an effort to reduce administrative burdens, improve controls, and accelerate the overall production-and-delivery process. Many have established their own supplier chains, assuming increased administrative responsibility in return for increased speed and efficiency.

The Agile Web provides a totally-coordinated resource through concept, design, manufacture, and final assembly. A single point of contact directs all aspects of multi-

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phase design-and-production projects. Moreover, Agile Web companies provide design engineering services with an intent to meet customers' aspirations for improvements in cost or quality of finished goods without adding to their internal overhead.

Web member companies, with combined revenues of \$250 million, have a broad diversity of capabilities. They include manufacture of electronics and mechanical assembly services of circuit boards, electro-mechanical equipment, precision machining and fabricating, custom die castings, complex wire assemblies, custom printed circuit boards, high quality communications equipment, precision sheet metal stampings, and custom finishes such as powder metallization and polishing.

In the area of new product development, Agile Web capabilities include prototyping, concept design, industrial design, pre-production, product engineering, production tooling, full-scale manufacturing and testing.

Funding to develop the Agile Web concept was provided by the federally-sponsored Technology Reinvestment Project matched by a portion of the Ben Franklin Technology Center's annual appropriation from the Pennsylvania Department of Commerce.

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The Evolution of Agile Web, Inc.

The concept for Agile Web, Inc. has evolved over the past several years as an outgrowth of two significant developments: the emergence of the agility concept in manufacturing, and the trend toward consolidating supplier chains in fabricated products.

Beginning in the late 80s, with the onset of widespread corporate downsizing, manufacturers began reducing their supplier base in an effort to add efficiency to the procurement process. This period also saw the beginnings of contractors organizing and managing supplier chains.

Small companies in particular were vulnerable to the trend toward consolidating the supplier base. Although these small firms weren't significantly affected yet, longer range the threat was unmistakable. It was during this period that a purchaser-inspired emphasis on partnering was increased in an attempt to meet changing needs and expectations among contractors.

The trend was particularly disquieting to officials at the Northeast Tier Ben Franklin Technology Center at Lehigh University insofar as eastern Pennsylvania's industrial base was overwhelmingly populated with various types of small to medium-sized manufacturers—precisely the sector under threat.

In response, Executive Director Mark Lang and his staff began considering how combining the resources of small to medium-sized manufacturing companies could lead to new business opportunities that were unavailable to the companies individually.

Their pursuit: to uncover opportunity from amid problems and threats— not only to protect jobs, but to develop an approach to generating new growth and economic vitality in the region. Indeed, what was envisioned was an opportunity to rearrange—possibly even revolutionize— business practices to enable small companies to compete more effectively in an environment of constant change.

At the same time, Lang's colleagues at Lehigh University's Iacocca Institute were defining the concept of agility, which would later be hailed as the new approach to manufacturing in the 21st century. There, Roger Nagel, formerly head of automation at International Harvester (and now the Institute's Executive Director), assembled executives from 13 prominent manufacturers to address the challenge of devising a

new approach whereby the U.S. could regain its manufacturing competitiveness. Nagel and other visionaries among the industrialists saw that companies succeeding in an evolving global economy shared certain characteristics, among them the ability to thrive and prosper in the changing economic environment and the ability to customize their products to the needs of specific companies, single contracts, even, they foresaw, to the needs of the individual.

Noting the work of the Agility Forum and the progress several large corporations were making in applying the principles of agility to compete more effectively, officials at Ben Franklin Technology Center set out to determine how agility could be productively applied among small to medium-sized enterprises.

Thus, the concept of Agile Web, Inc. emerged in early 1993: a group of companies with complementary capabilities, interwoven in a supply web, functioning as an agile manufacturer, with speed and efficiency in meeting emerging needs for customized output. In short, what manufacturing opportunities one company could not handle alone, several companies joining forces with strong communication and cooperation could handle together, creating more business opportunities for themselves and greater value for the customer.

Throughout that spring and summer, Ben Franklin executives met with candidates for inclusion in the Web. Sought were companies with established track records, up-to-date technology, complementary capabilities and an interest in taking part in something entirely new.

Invariably, the initial response from prospective member companies was one of interest but skepticism, the founders recall. However, as heads of small companies, the CEOs already were possessed of entrepreneurial mindsets and were intrigued by the concept, quickly recognizing potential benefits. As talks progressed, doubts dissipated, and companies signed on for what would be a long and time-consuming process of working out myriad complexities in structuring the web.

Meanwhile, at the federal level, government forecasters in several government departments and Congressional leaders became concerned about the ability of American industry to fill the needs of the defense sector and compete effectively in an increasingly demanding global market. Budget cuts forced the rethinking of the timeworn strategy of maintaining vast stockpiles of military hardware for any contingency, yet unpredictable flare-ups in global fighting continually produced an ever-changing need for spare parts and material. To help meet the growing needs of the defense sector, government officials developed the Technology Reinvestment Project to help American industry reinvent itself to meet external challenges as well as to support the needs of the military.

By August 1993, Ben Franklin had commitments from 19 participating companies. They agreed to participate in the site visit conducted by officials with the federal

government's Technology Reinvestment Project which was in the process of evaluating hundreds of grant proposals seeking funding for concepts aimed at strengthening the nation's small-company industrial base and meeting the needs of the defense sector.

In October of 1993, the Ben Franklin Technology Center was awarded a \$2 million grant over two years to determine how agility could be applied in small to medium-sized manufacturing companies. With that commitment, the framework for what would formally become Agile Web, Inc. was in place.

Over the next 18 months, Ben Franklin officials and executives of Agile Web member companies worked to fully define the concept, its implementation strategy and its operating procedures.

Numerous meetings were held with prospective customers, including major contractors such as APD Cryogenics, Rockwell, Texas Instruments and IBM, as well as mid-cap and startup companies. Interest in the concept and in working with Agile Web, Inc. was clearly confirmed, and the challenges facing the Web in providing services with increased value were equally clear.

Agile Web, Inc. was launched in June. Ted Y. Nickel, a former IBM executive and one of the original industry leaders who developed the agility concept at the landmark summit at the Iacocca Institute, was appointed CEO of the new corporation. Nickel, who is on loan from the Ben Franklin Technology Center, will report to the Agile Web, Inc. board of directors, which is made up of five representatives from member companies and the Ben Franklin Technology Center.

Questions and Answers on the Agile Web

1. What is Agile Web, Inc?

Agile Web, Inc. is a unique new corporation representing the collective capabilities of 19 small to medium-sized successful manufacturing and product-design companies in eastern Pennsylvania. The companies have combined sales of \$250 million.

2. Why was it formed?

Agile Web, Inc. was formed to meet an emerging need for an integrated multi-phase source of manufactured assemblies involving electronics and/or electromechanical products. In addition to meeting this emerging market need, Agile Web provides an opportunity for small, specialized design and manufacturing companies to compete for larger, multi-phase contracts that would otherwise be out of reach for each one individually. It is believed that Agile Web, Inc. can establish a new model of business practices among small and medium-sized manufacturers seeking to compete effectively in an era of consolidation of suppliers and customization in production.

3. Why is it needed?

Increasingly, large companies have sought to reduce the number of single-task contractors in a supplier chain, occasionally even taking on additional administrative burdens in managing their own supplier network. This is both a threat and an opportunity for small to medium-sized suppliers. The Agile Web offers a totally integrated supplier chain with unprecedented flexibility and the resources to add value in quality and productivity. Because of the diversity of its capabilities and its unique organizational configuration, Agile Web companies— through a single point of contact— can add their collective experience to influence concept development through product design, manufacture and final assembly for the most trouble-free production possible. This combination of breadth and flexibility is intended to deliver a demonstrably higher level of value-added than what is presently available in contract manufacturing today. Because it is made up of successful entrepreneurs, the Agile Web is oriented to forward thinking and leading-edge approaches.

4. How does the Web work?

Agile Web management will meet with prospective customers to identify precise areas in which the Web's integrated design and production capabilities may be applicable. The Web will actively seek opportunities where customers have needs that are not being fully satisfied by conventional sources. This may entail new product development and introduction as well as the application of entirely new technology or process redesign. Prospective customers include major contractors, mid-cap companies and startups which may need initial production facilities.

5. Is this a "virtual organization"?

Agile Web, Inc. is a Pennsylvania business corporation, privately-held by its member company shareholders.

In effect, however, it functions as a virtual organization, insofar as on a project-by-project basis different companies within the web participate to provide precisely the capabilities needed for each individual customer contract. This creates a level of efficiency and flexibility that is at the heart of the concept's efficacy in terms of value-added to customers.

6. How is Agile Web, Inc. financially supported?

Agile Web's initial funding has come from the federal government's Technology Reinvestment Project, matched by a portion of the Ben Franklin Technology Center's annual appropriation from the Pennsylvania Department of Commerce.

Once the new corporation is fully operational, it will be supported by funds generated from sales.

7. Why call it the Agile Web?

Agile refers to the concept of agility, developed in a landmark study involving prominent industrial executives facilitated by the Iacocca Institute at Lehigh University. Agile companies are flexible, changing to meet the customer's needs but also anticipating them. The Web refers to the interconnectedness of the companies involved, and the ability of the web companies to knit together in precisely the right configuration to achieve each task with speed, efficiency, and without waste.

8. Why is it believed the Agile Web will be successful?

Agile Web will be successful because of the combined skills of its component organizations, their respective track records of building successful enterprises, their entrepreneurial orientation and their dedication to serving the customers' needs. A key to Agile Web's success will be its breadth of skills and its flexibility in utilizing specific skills at precisely the moment they are needed, with no wasted time or expense.

9. What are the Web's advantages compared to purchasing from individual companies?

The Agile Web provides a totally coordinated approach to multi-task contracting through a single point of contact. As an organization of successful, forward-thinking companies, the Web is committed to new levels of quality and flexibility to achieve solutions, functioning as true partners with customers.

10. What are its advantages compared to purchasing from a larger company?

The Agile Web puts together the specific talents needed for the job without carrying the overhead for capabilities not needed for the specific project under development. Each company within the Web provides the service it does best, so each component of the project is made up of the highest quality, to produce a final product that is superior.

11. What is agility?

Agility is a new business and manufacturing philosophy. A short answer is that the truly agile company is able to say yes to a customer's request no matter what is asked. An agile company provides solutions.

The agile company is characterized by a sharing of needed information across the organization rather than within a traditional hierarchical structure. Products are delivered to the marketplace faster and pinpointed to the customer's requirements.

12. What types of projects is the Agile Web designed to produce?

Web member companies have a broad range of capabilities including assembly services for circuit boards, manufacture of electromechanical equipment, precision machining and fabricating, custom die castings, complex wire assemblies, custom printed circuit boards, high quality communications equipment, precision sheet metal, stamping, and custom finishes such as powder metallization and polishing. In the area of new product development, Agile Web capabilities include prototyping, concept design, industrial design, pre-production, product engineering, production tooling, full-scale manufacturing and testing. Specific industry segments targeted by Agile Web, Inc. include telecommunications, mobile communications, medical and home care medical, manufacturing systems and other capital equipment, computer enclosures, PC boards, robotics and motion control, consumer electronics, and the transportation industry. In particular, Agile Web's capabilities are well suited to serving the needs of the defense sector.

13. Will the Agile Web be able to respond to business opportunities as quickly as a fully integrated company?

The Agile Web member companies have a commitment to making speed its competitive advantage in the marketplace. Companies within the Web will be able to communicate through both e-mail and the electronic data interchange (edi), a computer-linked communications network, to facilitate quick and accurate responses.

14. Why will independent companies adopt a spirit of cooperation to work together within the Web?

Actually, several Web companies have worked cooperatively in the past. The Web concept expands the business opportunities of individual companies rather than limiting them, thus promoting cooperation. Successful, forward-looking enterprises joined to form the Web precisely because they saw the advantages of pooling their collective resources, becoming a goal-oriented supplier chain.

15. Has there been any market research?

Yes. Over the past two years we have worked with a number of major contractors, including APD Cryogenics, Rockwell International, Texas Instruments, and IBM, among others. All have indicated interest in the Agile Web concept and have encouraged our efforts.

16. Is this Web unique?

The new company is being established with the express purpose of applying the concept of agility among small to medium-sized companies to provide a first-of-its-kind supplier chain for innovative design and manufacturing.

17. Who am I dealing with and who's accountable if something goes wrong?

The customer's primary contact with the Web is Ted Nickel, president and chief executive officer. In addition, customers are free to meet with representatives of the participating companies during contract discussions, and, thereafter, throughout the course of the project. Thus, at any time, customers can communicate directly with the people actually doing the work under the leadership of Agile Web, Inc., just as if they were all working for the same firm. At the same time, through a single source at the Web, they can be immediately informed of the precise status of projects.

Agile Web, Inc. as prime contractor, is accountable to the customer. Additionally, participating web companies will have obligations as subcontractors. In the event of a dispute, the customer has recourse through Agile Web, Inc. Each participating company will sign a formal agreement setting forth its obligations on individual projects.

18. What was the selection criteria for Web members?

Web member companies were selected on the basis of 1) being successful enterprises with established reputations for quality products and forward thinking, 2) having complementary capabilities that are naturally linked in the supplier chain from design to production and delivery of completed electronic and/or electromechanical assemblies, and 3) being small to medium-sized enterprises which would benefit from joint involvement in an integrated supplier chain.

19. Why is this a Department of Defense initiative?

The Department of Defense believes it is in the national interest to develop a supplier base which can meet the increasing needs for new and upgraded weapons systems more quickly and cost effectively than existing arrangements with dedicated suppliers. To this end, the DoD funded the Technology Reinvestment Project to develop quick and responsive ways of replenishing replacement parts as well as producing entirely new systems and supplies on demand.

20. What are some of Agile Web's manufacturing capabilities?

Web member companies have extensive experience and expertise in the following fields:

- design and production of electromechanical assemblies;
- product industrial design, manufacturing and comprehensive development and pre-production services;
- rapid prototyping services;
- castings from design to machining in various alloys requiring up to a 1200 die locking force;
- precision machining;
- automated material handling;
- stamping of precision parts requiring up to a 2700 ton press;
- precision sheet metal fabrication;
- plastic molding from design of the molds to completion;
- custom metal fabrication;
- surface finishing including buffing, polishing, computerized graphics, silk screening, blast media etching, powder coating, teflon coating, spray metallization, porcelain enameling and other applications.
- electronics including advanced circuit board design and robotic assembly of printed circuit boards;
- full design, manufacture, and test of hardware and software required for high-speed telecommunications components including encryption technologies for commercial as well as defense contractors.
- customized refrigeration equipment assemblies;
- wire forming and fabrication;
- tube bending and shaping;
- robotic MIG and TIG welding;
- CNC wire EDM.

Appendix N

Information Technology and the Agile Web

When the concept of 'agility' was first put forward, information technology constituted one of its central components. Throughout Goldman, Nagel and Preiss' book, *Agile Competitors and Virtual Organizations*, information technology continually reappears as a driving force destined to transform the way all business will be conducted in the brave new "agile" world marketplace. Indeed, the very premise of the "virtual corporation" is rooted in the idea of information technology altering the very structure of the basic unit of production in the industrial age--the modern corporation. No longer confined within the walls and by the capabilities of a single plant or factory, the new, 'agile' corporation can transcend geographic space and couple with other facilities that possess the requisite competencies for any given market opportunity.

Given its preeminence in today's business world, information technology was, not surprisingly, seen as a fundamental component of the Agile Web pilot project. The BFTC team foresaw technology as the *sine qua non* in facilitating the rapid formation of virtual companies. It seemed eminently reasonable that information technology would provide the tool to allow a group of small design and manufacturing firms to team together and merge their collective capabilities into single units of production to meet specific customer opportunities.

The results after two years, however, have been mixed. The findings of the group provide some interesting lessons for those interested in what it takes for small manufacturers to come together and realize the potential of the "virtual corporation." In short, it appears that much more than a quick technological fix will be required to change the way small companies are able to do business.

Expectations

The Agile Web pilot project was designed to help the involved firms begin doing business in new and different ways, using agility as an overarching guide. Having some experience in setting up databases to be shared by companies in the region, BFTC sought to implement a full-fledged linking of manufacturing and design shops in Eastern Pennsylvania. The BFTC support team sought to link the Agile Web companies through a host of e-mail, Internet, groupware, and video-conferencing capabilities made accessible by PCs purchased and installed in the participating companies by the pilot-project overseers.

Over the course of the project, the BFTC made a significant effort in buttressing and, where necessary, helping to revamp the information mechanisms of the member companies.

Preliminary steps included installation of PCs for EDI and E-Mail, while long-term goals focused on implementing state-of-the-art, inter-firm project management software. In addition to allowing Web members to collaborate in "real time," the project support team envisioned an electronic-information system that would provide instant updates on project

status to Web management and the interested customer. The team also hoped to see the Agile Web utilize software packages to manage production schedules across firm lines.

Approaches and Early Results

The first steps in this direction included enhanced "real-time" communication, achieved through the installation of, and training in, electronic communication tools such as EDI and Internet E-mail. From these fundamental measures, the team moved forward and installed project-management software that was designed to make possible full concurrency in all facets of business among the Web participants involved in a given project. Through the sharing of resources and even actual production facilities, along with the exchange of engineering and design talent, it was hoped that the Web could realize full linkage of business processes among all of the eighteen AWI companies.

Quickly, however, it became apparent that companies were wary of transforming their methods of communication overnight. The majority of the members were reluctant even to incorporate E-mail into the daily routine of their business communications. At first, the BFTC team surmised that the problem emanated from the lack of integration of the Agile Web's Internet E-mail links with each company's own internal LAN systems. Accordingly, the team undertook an involved and expensive effort to tie the E-Mail into the individual company LANs.

Even after the Agile Web inter-company E-mail was integrated into the LAN systems at each company, few companies fully embraced even that rather rudimentary technology. It thus became apparent that the perceived technological barrier was not the real impediment to changing communication styles among the agile web companies. Rather, real cultural resistance prevented the adoption of the new technologies.

In essence, it boiled down to a classic "chicken and egg" problem. In the absence of direct payoffs, companies were reluctant to embrace a new technology, and devote the time and resources to learn and accommodate the new tools into their current systems. Furthermore, since the computer equipment was provided free of charge, as idle machinery it represented no sunk overhead costs, and therefore the only driver to use it was a *potential* gain. However, when business came through traditional channels, companies feared using a risky new technology unfamiliar to them. Hence, a vicious circle of sorts was born. Companies essentially were saying: "Unless customers specifically demand that I use these new technologies, I cannot afford to devote time and energy into moving up the learning curve."

And when business opportunities came along, companies unversed in the technologies were reluctant to risk using them and thereby lose business should something go awry. Moreover, without having invested their own capital in the equipment, any unrealized gains on the technology had no perceivable impact on their traditional accounting ledgers.

Conclusions

After two years, usage patterns in the area of information technology with the exception of small increases in e-mail and EDI, have been small. How can this apparent lack of interest be explained? In the eyes of the support team several reasons became apparent:

The imperative of embracing inter-firm communication technology did not penetrate many of the individual companies' organizations. A similar phenomenon--of individual firms' involvement with the Agile Web stopping at the CEO level--revealed itself in other aspects of the project, as well. Often with small firms the CEO represents the primary, if not the sole, interface with the outside world. For information technology, this inward focus often meant that the personnel with the Information Systems (IS) expertise within the companies were not included in the individual company's involvement with Agile Web. Hence, information technology--an essential enabling tool for virtual organizations--never received the necessary support within the individual Agile Web firms.

Also, companies' interest in, and commitment to, Information technology systems waxed and waned depending on several factors. Among the most significant was the level of demand being placed upon the companies by their traditional customer base, outside of Agile Web business. When existing business was good, companies had little time for Agile Web improvement projects, including information technology. While Agile Web always held out the promise of *future* business, most of the participating CEOs could not see value in devoting the resources of time and personnel for the *potential* gains to be realized by "new ways of doing business."

As with other improvement projects undertaken in the course of the pilot project, in the abstract each company expressed interest in new business practices. In actual practice, however, companies appeared to be looking for a quick tool--or magic bullet--to reach that next level. Very few understood the need to attempt to change the culture of their individual firms and fully embrace the concepts of agility--in the form of outlook as well as technological tools.

What does all this mean in the larger context of what is necessary to enable small firms to come together to form virtual organizations?

First: Confirming much of the findings in the broader literature on technological innovation and evolution, social and contextual preconditions must be right for technology to take root. In the case of the Agile Web this would mean establishing working relationships among the companies, as a precursor to the whole-scale implementation of new information-technology systems. In the Agile Web experience, after companies began to feel more comfortable with each other, they then seemed to be more willing to move into newer, untested areas of communication.

Second: A commitment to technology in the form of an individual firm's own money needs to be secured up front. As became evident in other Agile Web improvement initiatives, small companies' resources--especially in terms of their time--are quite constrained. Unless there is a bottom-line rationale driving the reallocation of resources, companies will continually put off improvement projects in which they do not have capital vested. While few of us in the modern world take full advantage of all of the resources

computers offer, a computer paid for by someone else is even more likely to collect dust, figuratively and literally, than one which represents a substantial investment on which a direct and measurable return must be realized.

Overall then, the Agile Web experience corroborates the observations made by various students of technological innovation. While at first glance it appears that technology exerts a powerful, even autonomous, influence upon society, the right social preconditions must in order for a technology to find its place. In the case of inter-firm collaboration and the formation of virtual organizations, Agile Web's experience suggests that cultural change within individual companies has to occur first and drive the adoption of new information technology systems.

AGILE WEB OPERATING PRINCIPLES

Flexibility in Changing Individual Roles to Satisfy our Customers

When participating in a project, AWI companies will represent themselves to customers as a seamless organization through the Agile Web and its President in a way that transcends the old "lead-sub" model. In dealing with AWI, the customer sees one seamless organization and pays for the final product.

All AWI participants must interface simultaneously with the customer and each other, and will not sit hierarchically removed down the food-chain, waiting for information, bids, and orders. All AWI participants share responsibility for each job.

In order to help each other achieve a new model of full concurrency and interaction, we will engage in improvement projects, such as simulations exercises, that will continually expose us to new, agile ways of performing.

At every level of the product life-cycle there are opportunities to add value. The Web companies must continually work to define these opportunities and must work together to add this value where customers cannot currently get (and in some cases cannot even perceive) this.

The value-added that distinguishes AWI in the marketplace requires that we:

- team together as a single entity under AWI with a united front
- be sensitive to other Web participants' needs, subordinating our normal demands in order to achieve the greater value-add of AWI
- proactively present the combined capabilities of the Agile Web, making informed presentations of the *positive* attributes that other members can bring to a project
- interact with clients and each other to come up with new approaches and solutions that add value at every level of the product life-cycle
- offer any and all of our competencies to other members in support of a project to the extent possible.
- demonstrate flexibility in responding to changing customer requirements by modifying the composition of the project team.

To keep roles clear, participants will not be given work until a memo of understanding has been sent that sets out schedule and obligations. For each project, there will be a statement of work and formal authorization that recognizes work that is compensated.

Project Management

The Project Manager will take on specific roles with vested authority, while the AWI President will provide the overall corporate overview and organization.

Subject to the overview of the President, the Project Manager will have ultimate control over a project, and he will work to find the optimal solution for the customer.

Participant consensus is required for changes when schedule, finance, and/or liability is affected--whenever a company commitment is involved.

Agile Web is about agilely matching and loaning competencies and capabilities, including empowering one's employees to make decisions for others and abiding by the decisions of others' employees.

We will have a project manager's manual to make this process formal.

We will TRUST each other and keep each other INFORMED to ensure that sound decisions are made.

The same consideration will be given to Web projects as is given to all other projects.

AWI companies have a commitment and responsibility to share information up front to head off jams wherever possible.

Pricing

(NOTE: FOR OUR PURPOSES: "COST" IS DEFINED AS THE EXPENSE INCURRED BY A COMPANY TO PRODUCE AND DELIVER A GOOD OR SERVICE, F.O.B. "SELL PRICE" IS DEFINED AS THE AMOUNT OF MONEY THE CUSTOMER PAYS FOR A PRODUCT. "CONTINGENCY" IS THAT PORTION OF THE COST THAT IS ADDED TO THE OTHER COST FACTORS IN ORDER TO COVER POSSIBLE FUTURE EXPENSES THAT CANNOT BE PRECISELY DETERMINED.)

The Web President will not disclose information without written permission from a company, and with permission will do so only on a job-by-job basis. With a customer external to the Web, only cost information necessary to be competitive will be disclosed.

Within the Web, it is useful to share the internal costing rationale and other information, and for the Web to function as team, in order to achieve the best sell-price for the customer.

AWI will not demand internal costing information (e.g. rates, raw materials, etc.), and divulging such information remains an individual company's prerogative.

To avoid inflated prices, we will make it clear if we do not want to participate in a job, and we will not quote on it.

Companies will be willing work as a team to modify their contingency pricing. But pricing modifications will not be dictated to companies that have knowledge of the rates of a specific industry.

Responsibilities

“Terms and Conditions,” “specifications,” a “statement of work,” and a “quality” plan will make clear who is responsible for what, and what our roles, responsibilities, and liabilities are for each project.

Qualifying a customer is important, and AWI will qualify its customers.

Giving budgetary quotes on a project does not necessarily convey commitment.

The agreement to do a job and the responsibilities for it are not set until the final terms are accepted.

Payments

Whenever possible, money up-front (e.g., for materials) and/or progress payments will be part of a contract. If the customer will not put in milestone or progress payments, then we will build the cost of money into our rates.

A “subcontractor” is different from a team player. If it is a Web project, and the customer does not pay the Web, there is no money to pay the participating companies. The Web has no assets; therefore, the team does not get paid until the Web gets paid.

Liabilities

The Web is not a shield from a financial or a liability standpoint; there is no hiding behind the web. If any one of us damages a product, he is responsible. Should such a situation arise, however, we will seek to cooperate and employ “teamwork”--like replacing materials at cost, etc.

In each contract, we will define how we are going to conduct business. If it is complex enough and there is enough money involved, we need to define liabilities in each specific Virtual Organization Contract (VOC), and also build this into our quality plan.

On a contract-by-contract basis there will be specific liabilities that will be defined.

Insurance

We will have AWI named as an "also insured" on our individual policies to cover our work with AWI, unless a project is outside the scope of what we normally do. If it is out of the participants' normal scope, AWI will obtain individual contract insurance for liability.

AWI will not seek to indemnify nor contractually commit to indirect or consequential damages.

Warranty

Warranty will be established on a project-by-project basis.

Workmanship warranty, individually backed by each participant, is part of the value that we have to present to the customer.

Within the Web, the president has authority to deal with problems, and beyond that there is arbitration.

Intellectual Property

All companies will continue to retain their own intellectual properties.

If a participating company or its employees create an invention that is not part of a contract or the statement of work, the intellectual property rights belong to the individual company. But if the resources of AWI and the participating companies are used, and this collaboration is outlined in the statement of work, AWI and the participating companies will negotiate the intellectual property rights on a case-by-case basis.

Intellectual property created by employees of AWI is the property of AWI.

Quality

Quality Assurance Plans will be in place for each contract, and participating members will agree to comply as part of their participation.

Although AWI may suggest and facilitate internal improvement processes, it will not dictate such measures to the Agile Web companies.

Project Teams

The President has the authority to select teams, and (1) he will always have a rationale for decisions and (2) he will make all decisions in accordance with the AWI bylaws.

Only the President or his designated contact can make a commitment to a customer on behalf of AWI.

If the Web supplies an opportunity, then the project is Web business. For business not obtained through AWI, however, subbing out or turning it over to the Web President for management remains an individual company's prerogative.

There will be an expectation that if a company brings a contact to the Web, then that company will be a member of the project team if at all possible.

Participating companies will be careful not to circumvent the Web on Web-supplied opportunities, even if requested to do so by a customer.

Internal Etiquette and Communication:

Sharing information is essential.

A single point of contact is essential for effective project coordination and customer interface; therefore, full disclosure of the participating companies' contacts with the customer on each project is necessary.

The President or Project Manager will keep participants informed as necessary, *and* on a regular basis.

Our responsibility for communication receives the same priority that we place on communication in our own companies. If a company commits to participation in a project, it accepts full responsibility for proper and timely performance. Any reservations a company has to participating on a given project need to be communicated up front.

We will encourage line-to-line communications, and where necessary demonstrate a commitment to give authority at the engineer level.

To ensure employees are familiar with Web objectives and project status, Web company leaders will let their people know when a project will affect their workforce.

Appendix P
AGILE WEB, INC.
(a Pennsylvania corporation)

SUBSCRIPTION AGREEMENT
(Common Stock)

THE SECURITIES BEING OFFERED FOR SALE HEREBY ARE EXEMPT FROM THE REGISTRATION REQUIREMENTS OF THE PENNSYLVANIA SECURITIES ACT OF 1972, AS AMENDED, PURSUANT TO SECTION 203(d) THEREOF. EACH PERSON WHO ACCEPTS AN OFFER TO PURCHASE THESE SECURITIES DIRECTLY FROM AN ISSUER OR AFFILIATE OF AN ISSUER SHALL HAVE THE RIGHT TO WITHDRAW HIS ACCEPTANCE WITHOUT INCURRING ANY LIABILITY TO THE SELLER, UNDERWRITER (IF ANY) OR ANY OTHER PERSON, WITHIN TWO (2) BUSINESS DAYS AFTER THE RECEIPT BY THE ISSUER OF HIS WRITTEN BINDING CONTRACT OF PURCHASE (THIS SUBSCRIPTION AGREEMENT) OR IN THE CASE OF A TRANSACTION IN WHICH THERE IS NO SUBSCRIPTION AGREEMENT, WITHIN TWO (2) BUSINESS DAYS AFTER HE MAKES THE INITIAL PAYMENT FOR THE SECURITIES BEING OFFERED. TO ACCOMPLISH THIS WITHDRAWAL, THE PURCHASER NEED ONLY SEND A LETTER OR TELEGRAM TO THE ISSUER (OR UNDERWRITER, IF ANY) INDICATING HIS INTENTION TO WITHDRAW. SUCH LETTER OR TELEGRAM SHOULD BE SENT AND POSTMARKED PRIOR TO THE END OF THE AFOREMENTIONED SECOND BUSINESS DAY. IF WITHDRAWAL BY LETTER IS USED, IT WOULD BE PRUDENT TO SEND IT BY CERTIFIED MAIL, RETURN RECEIPT REQUESTED, TO ENSURE THAT IT IS RECEIVED AND ALSO TO EVIDENCE THE TIME OF MAILING. SHOULD THE WITHDRAWAL NOTICE BE MADE ORALLY, A WRITTEN ACKNOWLEDGMENT OF RECEIPT SHOULD BE REQUESTED. UPON SUCH WITHDRAWAL, THE PURCHASER WILL HAVE NO OBLIGATION OR LIABILITY, UNDER HIS SUBSCRIPTION AGREEMENT, ARISING IN CONNECTION WITH THIS PURCHASE OF SECURITIES, TO THE ISSUER, SELLER, UNDERWRITER (IF ANY) OR ANY OTHER PERSON AND WILL BE ENTITLED TO THE FULL RETURN OF ANY AMOUNTS PAID BY HIM PURSUANT TO ANY CONTRACT OF PURCHASE. SUCH NOTICE SHOULD BE SENT TO MR. WILLIAM M. ADAMS AT 119 PREAKNESS DRIVE, MOUNT LAUREL NEW JERSEY 08054. WITHDRAWAL NOTICES MADE ORALLY SHOULD BE MADE TO MR. ADAMS AT (609) 222-0074.

THE SECURITIES SUBSCRIBED FOR PURSUANT TO THIS AGREEMENT HAVE NOT BEEN REGISTERED UNDER THE SECURITIES ACT OF 1933 OR ANY APPLICABLE STATE SECURITIES LAWS AND TRANSFER OF THE SECURITIES IS RESTRICTED BY SUCH LAWS AND THE TERMS OF THIS AGREEMENT.

NEITHER THE SECURITIES AND EXCHANGE COMMISSION NOR ANY OTHER FEDERAL OR STATE AGENCY OR AUTHORITY HAS PASSED ON, RECOMMENDED, OR ENDORSED THE MERITS OF THIS OFFERING. ANY REPRESENTATION TO THE CONTRARY IS UNLAWFUL.

SUBSCRIPTION AGREEMENT

This Agreement is made as of this _____ day of _____, 1997, by and between Agile Web, Inc., a Pennsylvania corporation ("the Company"), and the undersigned (the "Subscriber").

BACKGROUND

The Company is offering (the "Offering") to sell (i) up to 350,000 shares of Class A (voting) Common Stock, par value \$0.01 per share (the "Class A Common") and Class B (nonvoting) Common Stock, par value \$0.01 per share (the "Class B Common") and (ii) 120 shares of Series A Preferred Stock, par value \$0.01 per share (the "Preferred Stock") to certain existing shareholders and other entities and individuals who, through direct involvement in the management of the Company, understand its business, operations, financial condition and prospects, and the risks incident thereto. For purposes of this Subscription Agreement, the terms Class A Common and Class B Common shall together be referred to as the "Common Stock."

The Offering is being made (and open for subscription) from February ____, 1997 through March 15, 1997, subject to extension, from time to time, by the Board of Directors of the Company, for up to an additional thirty (30) days. Pursuant to the terms of the Company's Bylaws, the first ten thousand (10,000) shares of Common Stock subscribed for by a particular investor shall be issued as Class A Common and any additional shares subscribed for shall be issued as Class B Common. The purchase price for the Common Stock shall be \$1.00 per share, and the purchase price for the Preferred Stock shall be \$1,000.00 per share.

Upon the terms and conditions set forth in this Agreement, the Company desires to sell to the Subscriber and the Subscriber desires to purchase from the Company the number of shares of the Company's Class A Common and Class B Common, as set forth below.

NOW, THEREFORE, the parties hereto, intending to be legally bound hereby and in consideration of the premises and mutual covenants contained herein, agree as follows:

1. The Subscriber hereby subscribes for and agrees to purchase from the Company and the Company hereby agrees to sell to the Subscriber such number of shares of Common Stock as are set forth on page 8 hereof at a price per share of \$1.00. The Company and the Subscriber acknowledge and agree that the first (1st) Ten Thousand (10,000) shares of Common Stock purchased hereunder and/or held by the Subscriber (legally or beneficially) shall be Class A Common and any shares of Common Stock purchased and/or held by the Subscriber (legally or beneficially) in

excess of Ten Thousand (10,000) shares shall be Class B Common. For purposes of this Agreement, the securities purchased hereunder shall be hereinafter defined as the "Shares."

2. The closing of the sale of the Shares shall take place at the offices of the Company on the date hereof (the "Closing").

3. At the Closing, the Subscriber hereby makes a payment to the Company for one-half (½) of the Shares by delivering to the Company a check payable to the Company in the amount set forth on page 8 hereof, receipt of which by the Company is hereby acknowledged.

4. Promptly following the Closing, in exchange for the Subscriber's payment pursuant to Paragraph 3, the Company shall issue and deliver to the Subscriber stock certificates registered in the name of the Subscriber, evidencing the one-half (½) portion of the Shares being purchased hereunder.

5. Upon the determination of the Board of Directors of the Company that it is in the best interests of the Company to increase its cash balance and complete the sale of the remaining one-half (½) of the Shares, the Company shall give notice, in writing, to the Subscriber of such occurrence, whereupon the Subscriber shall pay the Company for the remaining one-half of the Shares within fifteen (15) business days of the date that such notice is delivered to the Subscriber. Time shall be of the essence. Promptly following the receipt of such payment, in exchange for the Subscriber's payment pursuant to this Paragraph 5, the Company shall issue and deliver to the Subscriber stock certificates registered in the name of the Subscriber, evidencing the remaining one-half (½) portion of the Shares being purchased hereunder. In the event of default by the Subscriber with respect to such payment, any unpaid amount shall accrue interest at the rate of one and one-half percent (1.5%) per month. All costs of collection, including but not limited to attorneys fees and expenses, shall be the obligation of the Subscriber and added to such unpaid amount. In addition, in the event of any distribution or dividend while the Subscriber is in default, the Company shall have the right to offset, against any amount owed to it by the Subscriber, the payment of any such distribution or dividend.

6. The Company hereby represents and warrants to the Subscriber that the Shares have been duly authorized and, when issued in accordance with this Agreement, will be validly issued, fully paid and non-assessable shares of Common Stock.

7. The Subscriber hereby represents, warrants, acknowledges and/or agrees as follows:

(a) It is active in the business and management of the Company and has full knowledge of the Company's business, financial condition, operations and prospects.

(b) It is acquiring the Shares without being furnished any sales literature or prospectus.

(c) It is acquiring the Shares solely for its own account for investment purposes and not with a view to resale or distribution of all or any part thereof. It has no present arrangement, understanding or agreement for transferring or disposing of all or any part of the Shares.

(d) Immediately prior to the purchase of the Shares, it has such knowledge and experience in financial and business matters that it is capable of evaluating the merits and risks of an investment in the Shares and to form an investment decision with respect thereto.

(e) It acknowledges that all material documents, records and books pertaining to this investment and the Company have been made available to it, and that the Company has made available to it, the opportunity to ask questions of, and receive answers from, the Company, concerning the Company and the terms and conditions of the investment and to obtain any additional information, to the extent that the Company possesses such information, or can acquire it without unreasonable effort or expense, necessary to verify the accuracy of the information given to it or otherwise to make an informed investment decision.

(f) It recognizes that the Company is an early stage company, that an investment in the Company is highly speculative and involves certain substantial risks, and that it has taken full cognizance of and understands and can evaluate all of the risks of the investment in the Shares. It has adequate net worth and means of providing for its current needs and personal contingencies to sustain a complete loss of its investment in the Company. It also recognizes that the acceptance by the Company of this subscription is not contingent on the Company's receipt of any minimum amount from other offerees of Shares. Proceeds of this offering will be used for general corporate purposes.

(g) It understands that the Shares are being offered and sold in reliance on specific exemptions from the registration requirements of Federal and state law and that the Company is relying upon the truth and accuracy of the representations, warranties, agreements, acknowledgments and understandings set forth herein in order to determine the applicability of such exemptions and the suitability of the Subscriber to acquire the Shares.

(h) It understands that it is not entitled to cancel, terminate or revoke this subscription, except as set forth in Paragraph 7(i) hereof.

(i) IT ACKNOWLEDGES THAT IT HAS THE RIGHT TO CANCEL AND WITHDRAW THIS SUBSCRIPTION AGREEMENT AND ITS PURCHASE OF SHARES UPON WRITTEN NOTICE TO THE COMPANY GIVEN WITHIN TWO (2) BUSINESS DAYS FOLLOWING RECEIPT BY THE COMPANY OF AN EXECUTED SUBSCRIPTION AGREEMENT FOR THE SHARES. UPON SUCH CANCELLATION OR WITHDRAWAL, IT WILL HAVE NO OBLIGATION OR DUTY UNDER THIS SUBSCRIPTION AGREEMENT TO THE COMPANY OR TO ANY OTHER PERSON AND WILL BE ENTITLED TO THE FULL RETURN OF ALL MONIES PAID BY IT PURSUANT TO THIS SUBSCRIPTION AGREEMENT. THE UNDERSIGNED FURTHER ACKNOWLEDGES THAT IT UNDERSTANDS THAT ANY NOTICE OF CANCELLATION OR WITHDRAWAL SHOULD BE MADE BY TELEGRAM OR CERTIFIED MAIL, RETURN RECEIPT REQUESTED, AND SHOULD BE SENT AND POSTMARKED BY THE END OF THE AFOREMENTIONED SECOND BUSINESS DAY. THE UNDERSIGNED FURTHER ACKNOWLEDGES THAT IT UNDERSTANDS THAT IF IT MAKES ITS REQUEST FOR THE WITHDRAWAL ORALLY, IT SHOULD ASK FOR WRITTEN CONFIRMATION THAT THE REQUEST HAS BEEN RECEIVED.

(j) It understands that (i) the Shares have not been registered under the Securities Act of 1933, as amended (the "Securities Act") or any state securities or "Blue Sky" laws pursuant to exemptions therefrom, (ii) the Company has no obligation or intention to register the Shares for resale under any federal or state securities laws, or to take any action (including the filing of reports or the publication of information required by Rule 144 under the Securities Act) which would make available any exemption from the registration requirements of such laws, and (iii) it is likely the undersigned, therefore, may be precluded from selling or otherwise transferring or disposing of any Shares or any portion thereof and may therefore have to bear the economic risk of investment in the Shares for an indefinite period.

(k) No broker or finder has acted for the undersigned in connection with its purchase of the Shares and no broker or finder is entitled to any broker's or finder's fees or other commissions in connection therewith based on agreements between the Subscriber and any broker or finder.

(l) It is headquartered in the Commonwealth of Pennsylvania.

8. The Subscriber acknowledges and covenants that:

(a) No federal or state agency has passed on, has recommended or has endorsed the merits of the Shares or this offering.

(b) The Shares have not been registered under the Securities Act or any applicable state securities laws by reason of exemptions from the registration requirements of the Act and such laws, and the Shares (or any part thereof) may not be sold, transferred or otherwise disposed of in the absence of an effective registration

statement for the Shares under the Securities Act and all applicable state securities laws, or unless an exemption from such registration is available.

(c) It agrees and understands that (i) it will not sell, transfer, assign or otherwise dispose of any Shares or any interest therein unless and until the undersigned (x) complies with the transfer restrictions set forth in the Bylaws of the Company, as such may be modified from time to time, (y) complies with all applicable requirements of federal and state securities laws; and (z) in the absence of an effective registration statement, provides the Company with an opinion of counsel which is satisfactory to the Company (both as to the issuer of the opinion and the form and substance thereof) that the Shares may be sold, transferred, assigned or disposed of without registration of the Shares under the Securities Act, and without violation of any applicable state securities laws (including any investor suitability standards) and (ii) with respect to any Pennsylvania subscriber, it will not sell, transfer, assign or otherwise dispose of any Shares or any interest therein, except in accordance with Pennsylvania Securities Commission Regulation 204.011, within twelve (12) months following its purchase of such Shares.

(d) The transfer of the Shares is restricted pursuant to the terms of the Bylaws of the Company, a form of which was previously delivered to, read and understood by the Subscriber. Subscriber agrees to comply with the terms of such Bylaws.

(e) Appropriate restrictive endorsement(s), such as set forth in Paragraph 9 hereof, will be placed upon the certificates evidencing the Shares subscribed to hereby to reflect the foregoing and that the Company will give appropriate stop transfer instructions to the person(s) in charge of the transfer of its securities.

9. In addition to the stock certificate legend set forth in the Bylaws, stock certificates representing the Shares issued to the Subscriber pursuant hereto shall bear the following or similar legend:

THE SECURITIES REPRESENTED BY THIS CERTIFICATE HAVE BEEN ACQUIRED FOR INVESTMENT AND HAVE NOT BEEN REGISTERED UNDER THE SECURITIES ACT OF 1933, AS AMENDED, OR ANY STATE SECURITIES LAWS. THE SECURITIES MAY NOT BE PLEDGED, HYPOTHECATED, SOLD OR TRANSFERRED IN THE ABSENCE OF AN EFFECTIVE REGISTRATION STATEMENT FOR THE SECURITIES UNDER THE SECURITIES ACT OF 1933 AND APPLICABLE STATE SECURITIES LAWS OR A SATISFACTORY OPINION OF COUNSEL SATISFACTORY TO THE COMPANY THAT SUCH PLEDGE, HYPOTHECATION, SALE OR TRANSFER IS EXEMPT THEREFROM UNDER ANY SUCH ACT AND APPLICABLE STATE SECURITIES LAWS.

10. The undersigned acknowledges that it understands the meaning of the representations, warranties, covenants and agreements made by it in this Subscription Agreement and hereby agrees to indemnify and hold harmless the Company, its stockholders, directors, officers and employees, and all persons deemed to be in control of any of the foregoing from and against any and all losses, costs, expenses, damages, liabilities and interest (including, without limitation, court costs and attorneys' fees) arising out of or due to a breach by the undersigned of any such representations, warranties, covenants and agreements. All such representations, warranties, covenants and agreements shall survive the delivery of this Subscription Agreement and the purchase by the undersigned of any Shares.

11. This Agreement constitutes the entire understanding among the parties with respect to the subject matter hereof, and supersedes any prior understanding and/or written or oral agreements among them.

12. This Agreement shall be governed by the laws of the Commonwealth of Pennsylvania, without regard to the principles of conflicts of laws thereof.

IN WITNESS WHEREOF, the parties have executed this Subscription Agreement on the date and year first written above.

AGILE WEB, INC.

By: _____
Title: President

SUBSCRIBER: _____

By: _____
Title: _____

Address: _____

Number of Shares Subscribed for at \$1.00 per share: _____

Amount of Check Enclosed: _____
50% of Total Subscription

Remaining Subscription Obligation: _____
50% of Total Subscription

AMENDED AND RESTATED

BYLAWS

OF

AGILE WEB, INC.

ARTICLE I

OFFICES

Section 1.1. Registered Office. The registered office of AGILE WEB, INC. (the "Corporation") in the Commonwealth of Pennsylvania shall be as specified in the Articles of Incorporation of the Corporation as they may from time to time be amended (the "Articles") or at such other place as the Board of Directors of the Corporation (the "Board") may specify in a statement of change of registered office filed with the Department of State of the Commonwealth of Pennsylvania.

Section 1.2. Other Offices. The Corporation may also have an office or offices at such other place or places either within or without the Commonwealth of Pennsylvania as the Board may from time to time determine or the business of the Corporation requires.

ARTICLE II

SHAREHOLDERS

Section 2.1 Eligibility. No person, firm, association, corporation or other entity is eligible to own capital stock of the Corporation except a person, firm, association, corporation or other entity who or which (i) meets such qualifications as are established by the Board from time to time and (ii) is approved by the Board.

Section 2.2 Limitation on Size of Holdings.

The maximum number of shares of Class A (voting) common stock of the Corporation permitted to be owned (legally, beneficially, directly or indirectly) by any shareholder at any one time shall be ten thousand and one (10,001) (the "Share Limit"). There shall be no limitation on the number of shares of Class B (nonvoting) common stock that can be owned by any shareholder. In the event that, pursuant to the provisions of this Article II, a shareholder acquires in excess of the Share Limit, such shareholder shall exchange, with the Corporation, Class A common stock for Class B common stock, on a one-for-one basis. Notwithstanding the foregoing, however, in the event and to the extent that such Share Limit is exceeded, all voting rights in respect of such excess shall be nullified.

Section 2.3 Transferability.

(a) No shareholders shall sell, assign, donate, pledge, transfer or otherwise dispose of or encumber (collectively, "Transfer") any shares of stock of the Corporation except by will or pursuant to the laws of descent and distribution, and except as specifically permitted by these Bylaws. The Corporation shall not cause or permit the Transfer of stock of the Corporation held by any shareholder to be made on its books unless the Transfer is specifically permitted by these Bylaws. If, nonetheless, such stock is Transferred in violation of the terms hereof, the Corporation shall have the right to deem such shares to be canceled on its books and not to be outstanding.

(b) If a shareholder becomes obligated to sell any shares ("Defaulting Shareholder") to the Corporation or any Purchaser under Article II of these Bylaws and fails to deliver such shares in accordance with the terms of these Bylaws, the Corporation or the Purchaser may, at its or his option, in addition to all other remedies it or he may have, send to the Defaulting Shareholder the purchase price for such Shares as is herein specified. Thereupon, the Corporation, upon written notice to the Defaulting Shareholder, shall (i) cancel on its books the certificate or certificates representing the shares to be sold and (ii)

in the case of any Purchaser, issue, in lieu thereof, in the name of the Purchaser, a new certificate or certificates representing such shares, and thereupon all of the Defaulting Shareholder's rights in and to such shares shall terminate.

Section 2.4 Right of First Refusal.

(a) If a shareholder desires to sell all or any part of its Shares pursuant to a bona fide, arm's length offer from a credit worthy third party, including another current shareholder of the Corporation (the "Proposed Transferee"), the shareholder shall submit a written offer (the "Offer") to sell such shares (the "Offered Shares") to the Corporation and the remaining shareholders (the "Purchasers"), on terms and conditions, including price, not less favorable to the Corporation and the Purchasers than those on which the shareholder proposes to sell the Offered Shares to the Proposed Transferee. The Offer shall disclose the identity of the Proposed Transferee, the number of Offered Shares proposed to be sold, the total number of Shares owned by the selling shareholder, the terms and conditions, including price, of the proposed sale and any other material facts relating to the proposed sale.

(b) If the Corporation desires to purchase all of the Offered Shares, the Corporation shall communicate in

writing its election to purchase (an "Acceptance") to the selling shareholder and the Purchasers, which Acceptance shall be delivered in person or mailed to the selling shareholder and the Purchasers within twenty (20) days of the date the Offer was made.

(c) Subject to and in accordance with the priorities of rights established in subsection (d) below, if the Corporation does not accept the Offer in accordance with Section 2.4(b), each Purchaser shall have the right to purchase that number of Offered Shares as shall be equal to its pro rata percentage of the outstanding shares of the Corporation (the "Fraction").

(d) The Purchasers shall have a right of oversubscription such that if any of the Purchasers fail to accept the Offer as to its or his full Fraction, the remaining Purchasers shall, among them, have the right to purchase up to the balance of the Offered Shares not so purchased. Such right of oversubscription may be exercised by such Purchaser by accepting the Offer as to more than its or his Fraction. If, as a result thereof, such oversubscriptions exceed the total number of Offered Shares available in respect of such oversubscription privilege, the shares purchasable by such oversubscribing Purchasers shall be reduced so as to sell the Offered Shares as nearly as

possible in accordance with their respective Fractions or as they may otherwise agree among themselves. In all instances, the Purchasers shall have the right to purchase only such Offered Shares as are not purchased by the Corporation.

(e) If any of the Purchasers desire to purchase all or any part of the Offered Shares, such Purchaser (a "Purchasing Shareholder") shall communicate in writing its or his Acceptance to the selling shareholder, which Acceptance shall state the number of Offered Shares the Purchasing Shareholder desires to purchase and shall be delivered in person or mailed to the selling shareholder at the address set forth in the Offer, with a copy to the Corporation and the other Purchasing Shareholders, within thirty (30) days of the date the Offer was made.

(f) If the Corporation and/or Purchasing Shareholders accept the Offer as to all of the Offered Shares, the sale of the Offered Shares to be sold to the Corporation or the Purchasing Shareholders pursuant to this Section 2.4 shall be made at the offices of the Corporation on the thirtieth (30th) day following the expiration of the 20-day period or 30-day period, as the case may be, after the Offer is made (or if such thirtieth (30th) day is not a business day, then on the next succeeding business day).

Such sales shall be effected by the selling shareholder's delivery to the Corporation or each Purchasing Shareholder, as the case may be, of a certificate or certificates evidencing the Offered Shares to be purchased by it or him, duly endorsed for transfer to the Corporation or the Purchasing Shareholder, as the case may be, which Shares shall be delivered free and clear of all liens, charges, claims and encumbrances of any nature whatsoever, against payment to the selling shareholder of the purchase price therefor by the Corporation or such Purchasing Shareholder, as the case may be. Payment for the Offered Shares shall be made as provided in the Offer or by wire transfer or certified check.

(g) If the Corporation and the Purchasing Shareholders do not agree to purchase all of the Offered Shares, then, subject to Section 2.1 hereof (the approval of the Proposed Transferee by the Board of Directors) the Offered Shares may be sold by the selling shareholder at any time within ninety (90) days after the date the Offer was made. Any such sale shall be to the approved Proposed Transferee, at not less than the price and upon other terms and conditions, if any, not more favorable to the Proposed Transferee than those specified in the Offer. Any Offered Shares not sold within such 90-day period shall continue to

be subject to the requirements of a prior offer pursuant to this Section 2.4.

Section 2.5. Option to Purchase. At any time, upon a recommendation of the President to the Board (or by the Board, without the necessity of such a recommendation), the Board shall have the right to cause the interest of a shareholder in the Corporation to be offered for sale to the Corporation (and the remaining shareholders) and require a shareholder to sell his or its shares of stock to the Corporation and remaining shareholders; provided that, in the event that (i) at the time of such recommendation or proposed Board action, a shareholder (if such shareholder is a natural person) or a member of the senior management of such shareholder (if such shareholder is not a natural person) is a member of the Board and (ii) the Board votes not to terminate the interest of the shareholder in the Corporation and require such shareholder to sell its share of stock to the Corporation, the recommendation of the President or such Board action shall be referred to the shareholders for action. In such event, upon a vote of the shareholders in favor of the recommendation of the President or the reversal of such Board action (in accordance with the provisions set forth in Article III hereof), the interest of such shareholder in the Corporation shall be deemed offered

for sale in accordance with the terms set forth in Section 2.4, except that the price per share shall be the fair market value of each Share determined in good faith by the Board of Directors of the Corporation.

Section 2.6. Notice. All offers or other communications to the Corporation regarding the subject of this Article II shall be in writing and delivered personally or mailed certified or registered mail, return receipt requested, properly addressed and postage prepaid to the Corporation at its registered office. All offers or other communications to the shareholder regarding the subject of this Article II shall be given in accordance with Section 13.5 hereof.

Section 2.7. Legends. All certificates of stock, in addition to the usual and necessary matters, shall contain the following legend:

"The ownership and transfer of stock in this Corporation is subject to and limited by the Bylaws of the Corporation. A copy of the Bylaws may be inspected at the registered office of this Corporation during normal business hours."

ARTICLE III

MEETINGS OF THE SHAREHOLDERS

Section 3.1. Place. All meetings of the shareholders shall be held at such places, within or without the Commonwealth of Pennsylvania, as the Board may from time to time determine.

Section 3.2. Annual Meeting. A meeting of the shareholders for the election of directors shall be held once each calendar year on such date as the Board shall determine. If the annual meeting is not called and held within six months after the end of a calendar year, any shareholder may call the meeting at any time after the expiration of such six-month period.

Section 3.3. Written Ballot. Unless required by a vote of the shareholders before the voting begins, elections of directors need not be by written ballot.

Section 3.4. Special Meetings. Special meetings of the shareholders, for any purpose or purposes, may be called at any time by the President of the Corporation, by shareholders entitled to cast at least 20% of the votes that all shareholders are entitled to cast at the particular meeting, or by the Board, upon written request delivered to the Secretary of the Corporation. Any request for a special

meeting of shareholders shall state the purpose or purposes of the proposed meeting. Upon receipt of any such request, it shall be the duty of the Secretary of the Corporation to give notice, in a manner consistent with Section 3.6 of these Bylaws, of a special meeting of the shareholders to be held at such time as the Secretary of the Corporation may fix, which time may not be, if the meeting is called pursuant to a statutory right, more than sixty (60) days after receipt of the request. If the Secretary of the Corporation shall neglect or refuse to fix the date of the meeting and give notice thereof, the person or persons calling the meeting may do so.

Section 3.5. Scope of Special Meetings. Business transacted at any special meeting shall be confined to the business stated in the notice.

Section 3.6. Notice. Written notice of every meeting of the shareholders, stating the place, the date and hour thereof and, in the case of a special meeting of the shareholders, the general nature of the business to be transacted thereat, shall be given in a manner consistent with the provisions of Section 13.5 of these Bylaws at the direction of the Secretary of the Corporation or, in the absence of the Secretary of the Corporation, any Assistant Secretary of the Corporation, at least ten (10) days prior

to the day named for a meeting called to consider a fundamental change under Chapter 19 of the Pennsylvania Business Corporation Law of 1988, as it may from time to time be amended (the "1988 BCL"), or five (5) days prior to the day named for the meeting in any other case, to each shareholder entitled to vote thereat on the date fixed as a record date in accordance with Section 9.1 of these Bylaws or, if no record date be fixed, then of record at the close of business on the 10th day next preceding the day on which notice is given or, if notice is waived, at the close of business on the day immediately preceding the day of the meeting, at such address (or telex, TWX, facsimile or telephone number), as appears on the transfer books of the Corporation. Any notice of any meeting of shareholders shall state that, for purposes of any meeting that has been previously adjourned for one or more periods aggregating at least fifteen (15) days because of an absence of a quorum, the shareholders entitled to vote who attend such a meeting, although less than a quorum pursuant to Section 3.7 of these Bylaws, shall nevertheless constitute a quorum for the purpose of acting upon any matter set forth in the original notice of the meeting that was so adjourned.

Section 3.7. Quorum. Except as otherwise provided in a bylaw adopted by the shareholders, the

shareholders present in person or by proxy, entitled to cast at least a majority of the votes that all shareholders are entitled to cast on any particular matter to be acted upon at the meeting, shall constitute a quorum for the purposes of consideration of, and action on, such matter. The shareholders present in person or by proxy at a duly organized meeting can continue to do business until the adjournment thereof notwithstanding the withdrawal of enough shareholders to leave less than a quorum. If a meeting cannot be organized because a quorum has not attended, the shareholders present in person or by proxy may, except as otherwise provided by the 1988 BCL and subject to the provisions of Section 3.8 of these Bylaws, adjourn the meeting to such time and place as they may determine.

Section 3.8. Adjournment. Adjournments of any regular or special meeting may be taken but any meeting at which directors are to be elected shall be adjourned only from day to day, or for such longer periods not exceeding fifteen (15) days as the shareholder present and entitled to vote shall direct, until the directors have been elected. Other than as provided in the last sentence of Section 3.6 of these Bylaws, notice of the adjourned meeting or the business to be transacted thereat need not be given, other than announcement at the meeting at which adjournment is

taken, unless the Board fixes a new record date for the adjourned meeting or the 1988 BCL requires notice of the business to be transacted and such notice has not previously been given. At any adjourned meeting at which a quorum is present, any business may be transacted that might have been transacted at the meeting as originally noticed.

Unless otherwise provided in a bylaw adopted by the shareholders, those shareholders entitled to vote present in person or by proxy, although less than a quorum pursuant to Section 3.7 of these Bylaws, shall nevertheless constitute a quorum for the purpose of (i) electing directors at a meeting called for the election of directors that has been previously adjourned for lack of a quorum, and (ii) acting, at a meeting that has been adjourned for one or more periods aggregating fifteen (15) days because of an absence of a quorum, upon any matter set forth in the original notice of such adjourned meeting, provided that such original notice shall have complied with the last sentence of Section 3.6 of these Bylaws.

Section 3.9. Majority Voting. Any matter brought before a duly organized meeting for a vote of the shareholders shall be decided by a majority of the votes cast at such meeting by the shareholders present in person or by proxy and entitled to vote thereon, unless the matter

is one for which a different vote is required by express provision of the 1988 BCL, the Articles or a bylaw adopted by the shareholders, in any of which case(s) such express provision shall govern and control the decision on such matter.

Section 3.10. Voting Rights. Except as otherwise provided in the Articles, at every meeting of the shareholders, every shareholder entitled to vote shall have the right to one vote for each share having voting power standing in his or her name on the books of the Corporation.

Section 3.11. Proxies. Every shareholder entitled to vote at a meeting of the shareholders or to express consent or dissent to corporate action in writing may authorize another person to act for him or her by proxy. The presence of, or vote or other action at a meeting of shareholders, or the expression of consent or dissent to corporate action in writing, by a proxy of a shareholder, shall constitute the presence of, or vote or action by, or written consent or dissent of the shareholder. Every proxy shall be executed in writing by the shareholder or by the shareholder's duly authorized attorney in fact and filed with the Secretary of the Corporation. A proxy, unless coupled with an interest, shall be revocable at will, notwithstanding any other agreement or any provision in the

proxy to the contrary, but the revocation of a proxy shall not be effective until written notice of revocation has been given to the Secretary of the Corporation. No unrevoked proxy shall be valid after three (3) years from the date of its execution, unless a longer time is expressly provided therein. A proxy shall not be revoked by the death or incapacity of the maker unless, before the vote is counted or the authority is exercised, written notice of such death or incapacity is given to the Secretary of the Corporation.

Section 3.12. Voting Lists. The officer or agent having charge of the transfer books for securities of the Corporation shall make a complete list of the shareholders entitled to vote at a meeting of the shareholders, arranged in alphabetical order, with the address of and the number of shares held by each shareholder, which list shall be produced and kept open at the time and place of the meeting and shall be subject to the inspection of any shareholder during the whole time of the meeting.

Section 3.13. Judges of Election. In advance of any meeting of the shareholders, the Board may appoint judges of election, who need not be shareholders, to act at such meeting or any adjournment thereof. If judges of election are not so appointed, the presiding officer of any such meeting may, and on the request of any shareholder

shall, appoint judges of election at the meeting. The number of judges shall be one or three, as determined by the Board to be appropriate under the circumstances. No person who is a candidate for office to be filled at the meeting shall act as a judge at the meeting. The judges of election shall do all such acts as may be proper to conduct the election or vote with fairness to all shareholders, and shall make a written report of any matter determined by them and execute a certificate of any fact found by them, if requested by the presiding officer of the meeting or any shareholder or the proxy of any shareholder. If there are three judges of election, the decision, act or certificate of a majority shall be effective in all respects as the decision, act or certificate of all.

Section 3.14. Participation by Conference Call.

The right of any shareholder to participate in any shareholders' meeting by means of conference telephone or similar communications equipment by means of which all persons participating in the meeting may hear each other, in which event all shareholders so participating shall be deemed present at such meeting, shall be granted solely in the discretion of the Board.

ARTICLE IV

SHAREHOLDER ACTION BY WRITTEN CONSENT

Section 4.1. Unanimous Written Consent. Any

action required or permitted to be taken at a meeting of the shareholders or of a class of shareholders may be taken without a meeting if, prior or subsequent to the action, a consent or consents thereto in writing, setting forth the action so taken, shall be signed by all of the shareholders who would be entitled to vote at a meeting for such purpose and filed with the Secretary of the Corporation.

Section 4.2. Record Date - Consents. Except as

otherwise provided in Section 9.1 of these Bylaws, the record date for determining shareholders entitled to express consent or dissent to action in writing without a meeting, when prior action by the Board is not necessary, shall be at the close of business on the day on which the first written consent or dissent is filed with the Secretary of the Corporation. If prior action by the Board is necessary, the record date for determining such shareholders shall be at the close of business on the day on which the Board adopts the resolution relating to such action.

ARTICLE V

DIRECTORS

Section 5.1. Number and Qualifications. The Board shall consist of five (5) directors, a minimum of three of whom shall be (i) shareholders of the Corporation (if such shareholder is a natural person) or (ii) representatives of the senior management of shareholders of the Corporation (if such shareholder is not a natural person); provided that no more than one representative of the senior management of any particular shareholder which is not a natural person shall serve on the Board at any time. Except as provided in Section 5.3 of these Bylaws in the case of vacancies, directors, other than those constituting the first board of directors, shall be elected by the shareholders. Directors shall be natural persons of full age and need not be residents of the Commonwealth of Pennsylvania or, except as set forth in the first sentence of this Section 5.1, security holders of the Corporation.

Section 5.2. Term. Each director shall be elected to serve a term of one year and until a successor is elected and qualified or until the director's earlier death, resignation or removal.

Section 5.3. Vacancies. Vacancies in the Board, including vacancies resulting from an increase in the number of directors, shall be filled by a majority vote of the remaining members of the Board, even though less than a quorum, or by a sole remaining director, and each person so elected shall serve as a director for the balance of the unexpired term. If one or more directors resign from the Board effective at a future date, the directors then in office, including those who have resigned, shall have the power to fill the vacancies by a majority vote, the vote thereon to take effect when the resignations become effective.

Section 5.4. Removal. The entire Board or any one or more directors may be removed from office without assigning any cause by the vote of the shareholders.

Section 5.5. Powers. The business and affairs of the Corporation shall be managed under the direction of its Board, which may exercise all powers of the Corporation and do all such lawful acts and things as are not by statute or by the Articles or these Bylaws directed or required to be exercised and done by the shareholders.

Section 5.6. Place of Board Meetings. Meetings of the Board may be held at such place within or without the Commonwealth of Pennsylvania as the Board may from time to

time appoint or as may be designated in the notice of the meeting.

Section 5.7. First Meeting of Newly Elected

Board. The first meeting of each newly elected Board may be held at the same place and immediately after the meeting at which such directors were elected and no notice shall be required other than announcement at such meeting. If such first meeting of the newly elected Board is not so held, notice of such meeting shall be given in the same manner as set forth in Section 5.8 of these Bylaws with respect to notice of regular meetings of the Board.

Section 5.8. Regular Board Meetings; Notice.

Regular meetings of the Board may be held at such times and places as shall be determined from time to time by resolution of at least a majority of the whole Board at a duly convened meeting, or by unanimous written consent. The Secretary may, but need not, provide notice of each regular meeting of the Board, specifying the date, place and hour of the meeting in a manner consistent with Section 13.5 of these Bylaws.

Section 5.9. Special Board Meetings; Notice.

Special meetings of the Board may be called by the President of the Corporation on notice to each director, specifying the date, place and hour of the meeting and given within the

same time and in the same manner provided for notice of regular meetings in Section 5.8 of these Bylaws. Special meetings shall be called by the Secretary of the Corporation in like manner and on like notice on the written request of two directors.

Section 5.10. Quorum of the Board. At all meetings of the Board, the presence of a majority of the directors in office shall constitute a quorum for the transaction of business, and the acts of a majority of the directors present and voting at a meeting at which a quorum is present shall be the acts of the Board. If a quorum shall not be present at any meeting of directors, the directors present thereat may adjourn the meeting. It shall not be necessary to give any notice of the adjourned meeting or of the business to be transacted thereat other than by announcement at the meeting at which such adjournment is taken.

Section 5.11. Committees of Directors. The Board may, by resolution adopted by a majority of the directors in office, establish one or more committees, each committee to consist of one or more of the directors, and may designate one or more directors as alternate members of any committee, who may replace any absent or disqualified member at any meeting of the committee or for the purposes of any written

action by the committee. Any such committee, to the extent provided in such resolution of the Board or in these Bylaws, shall have and may exercise all of the powers and authority of the Board; provided, however, that no such committee shall have any power or authority to (i) submit to the shareholders any action requiring approval of the shareholders under these Bylaws or the 1988 BCL, (ii) create or fill vacancies on the Board, (iii) amend or repeal these Bylaws or adopt new bylaws, (iv) amend or repeal any resolution of the Board that by its terms is amendable or repealable only by the Board, (v) act on any matter committed by these Bylaws or by resolution of the Board to another committee of the Board, (vi) amend the Articles, or (vii) adopt a plan or an agreement of merger or consolidation. In the absence or disqualification of a member or alternate member or members of a committee, the member or members thereof present at any meeting and not disqualified from voting, whether or not a quorum is present, may unanimously appoint another director to act at the meeting in the place of any absent or disqualified member. Minutes of all meetings of any committee of the Board shall be kept by the person designated by such committee to keep such minutes. Copies of such minutes and any writing setting forth an action taken by written consent

without a meeting shall be distributed to each member of the Board promptly after such meeting is held or such action is taken. Each committee of the Board shall serve at the pleasure of the Board.

Section 5.12. Participation in Board Meetings by Telephone. One or more directors may participate in a meeting of the Board or of a committee of the Board by means of conference telephone or similar communications equipment by means of which all persons participating in the meeting can hear each other, and all directors so participating shall be deemed present at the meeting.

Section 5.13. Action by Consent of Directors. Any action required or permitted to be taken at a meeting of the Board or of a committee of the Board may be taken without a meeting if, prior or subsequent to the action, a consent or consents in writing setting forth the action so taken shall be signed by all of the directors in office or the members of the committee, as the case may be, and filed with the Secretary of the Corporation.

Section 5.14. Compensation of Directors. Directors shall receive no compensation or expense reimbursement in connection with the performance of their duties as directors of the Corporation, except to the extent expressly approved by the shareholders.

Section 5.15. Directors' Liability. No person who is or was a director of the Corporation shall be personally liable for monetary damages for any action taken, or any failure to take any action, unless (a) such director has breached or failed to perform the duties of his or her office under the 1988 BCL and (b) the breach or failure to perform constitutes self-dealing, willful misconduct or recklessness, or unless such liability is imposed pursuant to a criminal statute or for the payment of taxes pursuant to local, state or federal law.

ARTICLE VI

OFFICERS

Section 6.1. Number and Qualification. The officers of the Corporation shall be a President, a Secretary, and a Treasurer, or persons who shall act as such, regardless of the name or title by which they may be designated, elected or appointed, and, in addition, the Corporation may have one or more Vice Presidents and such other officers and assistant officers as the Board may elect. The President, all Vice Presidents and the Secretary shall be natural persons of full age. The Treasurer may be a corporation, but if a natural person shall be of full age. Any number of offices may be held by the same person.

Officers may, but need not be, shareholders or members of the Board.

Section 6.2. Election. The officers and assistant officers shall be elected or appointed by the Board at its annual meeting, or as soon thereafter as possible, and shall hold office for a term of one year, or such longer term as may be approved by the shareholders, and until their successors are selected and qualified or until their earlier death, resignation or removal.

Section 6.3. Other Officers. The Corporation may have such other officers, assistant officers, agents and employees as the Board may deem necessary, each of whom shall hold office for such period, have such authority and perform such duties as the Board or the President may from time to time determine. The Board may delegate to the President the power to appoint or remove, and set the compensation of, any such other officers and any such agents or employees.

Section 6.4. Compensation. Except as provided in Section 6.3 of these Bylaws, the salaries of all officers of the Corporation shall be fixed by the Board.

Section 6.5. Vacancies. A vacancy by reason of death, resignation or removal of any officer or assistant

officer or by reason of the creation of a new office may be filled by the Board.

Section 6.6. Removal. Any officer or agent may be removed by the Board, or by an officer pursuant to Section 6.3 of these Bylaws, with or without cause, but such removal shall be without prejudice to the contract rights, if any, of the person so removed. The election or appointment of an officer or agent shall not of itself create any contract rights.

Section 6.7. General Duties. All officers and assistant officers, as between themselves and the Corporation, shall have such authority and perform such duties in the management of the Corporation as may be provided in these Bylaws and as may be determined by resolution of the Board not inconsistent with these Bylaws.

Section 6.8. The President. Subject to the general oversight of the Corporation by the Board, the President shall be the chief executive officer of the Corporation; he or she shall preside at all meetings of the shareholders, shall have general and active management of the business of the Corporation and shall see that all orders and resolutions of the Board are carried into effect.

Section 6.9. The Vice Presidents. The Vice President, or if there shall be more than one, the Vice

Presidents, in the order determined by the Board, shall, in the absence or disability of the President, perform the duties and exercise the powers of the President and shall perform such other duties and have such other powers as the Board may from time to time prescribe or the President may delegate to them.

Section 6.10. The Secretary. The Secretary shall attend all sessions of the Board and all meetings of the shareholders and record all the votes of the Corporation and the minutes of all the transactions in a book to be kept for that purpose, and shall perform like duties for the committees of the Board when required. The Secretary shall give, or cause to be given, notice of all meetings of the shareholders and of the Board, and shall perform such other duties as may be prescribed by the Board, under whose supervision the Secretary shall be. He or she shall keep in safe custody the corporate seal, if any, of the Corporation.

Section 6.11. The Treasurer.

(a) The Treasurer shall have the custody of the corporate funds and securities and shall keep full and accurate accounts of receipts and disbursements in books belonging to the Corporation, and shall deposit all moneys and other valuable effects in the name and to the credit of

the Corporation in such depositories as shall be designated by the Board.

(b) The Treasurer shall disburse the funds of the Corporation as may be ordered by the Board, taking proper vouchers for such disbursements, and shall render to the President and directors, at the regular meetings of the Board, or whenever they may require it, an account of all his or her transactions as Treasurer.

Section 6.12. Bonds. If required by the Board, any officer shall give the Corporation a bond in such sum, and with such surety or sureties as may be satisfactory to the Board, for the faithful discharge of the duties of his or her office and for the restoration to the Corporation, in the case of his or her death, resignation, retirement or removal from office, of all books, papers, vouchers, money and other property of whatever kind in his or her possession or under his or her control belonging to the Corporation.

ARTICLE VII

CERTIFICATES FOR SHARES

Section 7.1. Share Certificates. The certificates representing shares of the Corporation shall be numbered and registered in a share register as they are issued. The share register shall exhibit the names and

addresses of all registered holders and the number and class of shares and the series, if any, held by each.

Section 7.2. Execution of Certificates. Every share certificate shall be executed, by facsimile or otherwise, by or on behalf of the Corporation, by the President, by any Vice-President, or by the Secretary. In case any officer who has signed or whose facsimile signature has been placed upon any share certificate shall have ceased to be such officer, because of death, resignation or otherwise, before the certificate is issued, it may be issued by the Corporation with the same effect as if the officer had not ceased to be such at the time of issue.

ARTICLE VIII

TRANSFER OF SHARES

Section 8.1. Transfer; Duty of Inquiry. All Transfers of shares of capital stock of this Corporation (or any interest therein) shall be subject to the provisions set forth in Article II hereof. Upon presentment to the Corporation or its transfer agent of a share certificate indorsed to the Corporation by the appropriate person or accompanied by proper evidence of succession, assignment or authority to transfer, such certificate shall be canceled upon the books of the Corporation, unless the Corporation or

its transfer agent has a duty to inquire as to adverse claims with respect to such certificate which has not been discharged. The Corporation shall have no duty to inquire into adverse claims with respect to cancellation of its securities or the rightfulness thereof unless (a) the Corporation has received written notification of an adverse claim at a time and in a manner which affords the Corporation a reasonable opportunity to act on it before the cancellation and the notification identifies the claimant, the registered owner and the issue of which the share certificate is a part and provides an address for communications directed to the claimant; or (b) the Corporation has required and obtained, with respect to a fiduciary, a copy of a will, trust, indenture, articles of co-partnership, bylaws or other controlling instruments, for a purpose other than to obtain appropriate evidence of the appointment or incumbency of the fiduciary, and such documents indicate, upon reasonable inspection, the existence of an adverse claim.

Section 8.2. Discharging Duty of Inquiry. The Corporation may discharge any duty of inquiry by any reasonable means, including notifying an adverse claimant by registered or certified mail at the address furnished by the claimant or, if there is no such address, at the claimant's

residence or regular place of business, that the security has been presented for cancellation by a named person, and that the cancellation will be registered unless within thirty (30) days from the date of mailing the notification, either (a) an appropriate restraining order, injunction or other process issues from a court of competent jurisdiction or (b) an indemnity bond, sufficient in the Corporation's judgment to protect the Corporation and any transfer agent, registrar or other agent of the Corporation involved from any loss which it or they may suffer by complying with the adverse claim, is filed with the Corporation.

ARTICLE IX

RECORD DATE

Section 9.1. Record Date. The Board may fix a time, prior to the date of any meeting of the shareholders, as a record date for the determination of the shareholders entitled to notice of, or to vote at, the meeting, which time, except in the case of an adjourned meeting, shall not be more than ninety (90) days prior to the date of the meeting. Except as otherwise provided in Section 9.2 of these Bylaws, only the shareholders of record at the close of business on the date so fixed shall be entitled to notice of, or to vote at, such meeting, notwithstanding any

transfer of securities on the books of the Corporation after any record date so fixed. The Board may similarly fix a record date for the determination of shareholders for any other purpose. When a determination of shareholders of record has been made as herein provided for purposes of a meeting, the determination shall apply to any adjournment thereof unless the Board fixes a new record date for the adjourned meeting.

ARTICLE X

REGISTERED SHAREHOLDERS

Section 10.1. Before due presentment for cancellation of any shares, the Corporation shall treat the registered owner thereof as the person exclusively entitled to vote, to receive notifications and otherwise to exercise all the rights and powers of an owner, and shall not be bound to recognize any equitable or other claim or interest in such securities, whether or not it shall have express or

other notice thereof, except as otherwise provided by the laws of the Commonwealth of Pennsylvania.

ARTICLE XI

LOST CERTIFICATES

Section 11.1. If the owner of a share certificate claims that it has been lost, destroyed, or wrongfully taken, the Corporation shall issue a new certificate in place of the original certificate if the owner so requests, and if the owner has filed with the Corporation an indemnity bond and an affidavit of the facts satisfactory to the Board or its designated agent, and has complied with such other reasonable requirements, if any, as the Board may deem appropriate.

ARTICLE XII

DISTRIBUTIONS

Section 12.1. Distributions. Distributions upon the shares of the Corporation, whether by dividend, purchase or redemption or other acquisition of its shares subject to any provisions of the Articles related thereto, may be authorized by the Board at any regular or special meeting of the Board and may be paid directly or indirectly in cash, in

property or by the incurrence of indebtedness by the Corporation.

Section 12.2. Reserves. Before the making of any distributions, there may be set aside out of any funds of the Corporation available for distributions such sum or sums as the Board from time to time, in its absolute discretion, deems proper as a reserve fund to meet contingencies, or for equalizing dividends, or for repairing or maintaining any property of the Corporation, or for such other purpose as the Board shall deem conducive to the interests of the Corporation, and the Board may abolish any such reserve in the manner in which it was created.

ARTICLE XIII

GENERAL PROVISIONS

Section 13.1. Financial Reports to Shareholders.

Unless waived in a written agreement by the shareholders, separate from the Articles of Incorporation or these Bylaws, the Corporation shall furnish to its shareholders annual financial statements, including at least a balance sheet as of the end of each fiscal year and a statement of income and expenses for the fiscal year. The financial statements shall be prepared on the basis of generally accepted accounting principles, if the Corporation prepares financial

statements for the fiscal year on that basis for any purpose, and may be consolidated statements of the Corporation and one or more of its subsidiaries, if any.

The financial statements shall be mailed by the Corporation to each of its shareholders entitled thereto within 120 days after the close of each fiscal year and, after the mailing and upon written request, shall be mailed by the Corporation to any shareholder or beneficial owner entitled thereto to whom a copy of the most recent annual financial statements has not previously been mailed. Statements that are audited or reviewed by a public accountant shall be accompanied by the report of the accountant. In other cases, each copy shall be accompanied by a statement of the person in charge of the financial records of the Corporation:

- (a) stating his reasonable belief as to whether or not the financial statements were prepared in accordance with generally accepted accounting principles and, if not, describing the basis of presentation, and

- (b) describing any material respects in which the financial statements were not prepared on a basis consistent with those prepared for the previous year.

Section 13.2. Checks and Notes. All checks or demands for money and notes of the Corporation shall be signed by such officer or officers as the Board may from time to time designate.

Section 13.3. Fiscal Year. The fiscal year of the Corporation shall be as determined by the Board.

Section 13.4. Seal. The corporate seal, if any, shall have inscribed thereon the name of the Corporation, the year of its organization and the words "Corporate Seal, Pennsylvania." Such seal may be used by causing it or a facsimile thereof to be impressed or affixed or in any manner reproduced. The affixation of the corporate seal shall not be necessary to the valid execution, assignment or endorsement of any instrument or other document by the Corporation.

Section 13.5. Notices. Whenever, under the provisions of the 1988 BCL or of the Articles or of these Bylaws or otherwise, written notice is required to be given to any person, it may be given to such person either personally or by sending a copy thereof by first class or express mail, postage prepaid; telegram (with messenger service specified); telex; TWX (with answerback received); recognized overnight delivery service (with charges prepaid); courier service (with charges prepaid) or

facsimile transmission, to his or her address, (or to his or her telex, TWX, or facsimile number), appearing on the books of the Corporation or, in the case of directors, supplied by the director to the Corporation for the purpose of notice. If the notice is sent by mail, telegraph or courier service, it shall be deemed to have been given to the person entitled thereto when deposited in the United States mail or with a telegraph office or courier service for delivery to that person. A notice given by telex or TWX shall be deemed to have been given when dispatched.

Section 13.6. Waiver of Notice. Whenever any notice is required to be given by the 1988 BCL or by the Articles or these Bylaws, a waiver thereof in writing, signed by the person or persons entitled to the notice, whether before or after the time stated therein, shall be deemed equivalent to the giving of such notice. Neither the business to be transacted at nor the purpose of a meeting need be specified in the waiver of notice of the meeting. Attendance of a person at any meeting shall constitute a waiver of notice of the meeting, except where any person attends a meeting for the express purpose of objecting to the transaction of any business because the meeting was not lawfully called or convened, and the person so objects at the beginning of the meeting.

ARTICLE XIV

AMENDMENTS

Section 14.1. Amendments. Upon the recommendation of the Board, these Bylaws may be adopted, amended or repealed only by a majority vote of the shareholders entitled to vote thereon at any regular or special meeting duly convened. Written notice shall be given to each shareholder that the purpose, or one of the purposes, of the meeting is to consider the adoption, amendment or repeal of the Bylaws. There shall be included in, or enclosed with the notice, a copy of the proposed amendment or a summary of the changes to be effected thereby. Any change in the Bylaws shall take effect when adopted unless otherwise provided in the resolution effecting the change.

ARTICLE XV

FUNDAMENTAL CHANGES

Section 15.1. Fundamental Changes. Upon the recommendation of the Board, the dissolution, sale of all of the assets, merger with another entity, or other fundamental change of the Corporation may be adopted and approved only by a majority vote of the shareholders entitled to vote

thereon at any regular or special meeting duly convened. Written notice shall be given to each shareholder that the purpose or one of the purposes, of the meeting is to consider the adoption and approval of the dissolution, sale of all of the assets, merger with another entity, or other fundamental change of the Corporation. There shall be included in, or enclosed with the notice, a summary of the proposed dissolution, sale of all of the assets, merger with another entity, or other fundamental change to be acted upon.

ARTICLE XVI

INDEMNIFICATION

Section 16.1. Officers and Directors - Direct Actions. The Corporation shall indemnify, to the extent permitted under these Bylaws, any person who was or is a party (other than a party plaintiff suing on his or her own behalf), or who is threatened to be made such a party, to any threatened, pending or completed action, suit or proceeding, whether civil, criminal, administrative or investigative (other than an action by or in the right of the Corporation) arising out of, or in connection with, any actual or alleged act or omission or by reason of the fact that he or she is or was a director or officer of the Corporation, or is or was serving at the request of the

Corporation as a director or officer of another domestic or foreign corporation for profit or not-for-profit, partnership, joint venture, trust or other enterprise, against expenses (including attorneys' fees), judgments, fines and amounts paid in settlement actually and reasonably incurred by him or her in connection with such action, suit or proceeding if he or she met the standard of conduct of (i) acting in good faith and in a manner he or she reasonably believed to be in, or not opposed to, the best interests of the Corporation and (ii) with respect to any criminal proceeding, having no reasonable cause to believe his or her conduct was unlawful. The termination of any action or proceeding by judgment, order, settlement or conviction or upon a plea of nolo contendere or its equivalent shall not of itself create a presumption that the person did not act in good faith and in a manner that he or she reasonably believed to be in, or not opposed to, the best interests of the Corporation and, with respect to any criminal proceeding, had reasonable cause to believe that his or her conduct was unlawful.

Section 16.2. Officers and Directors - Derivative Actions. The Corporation shall indemnify any person who was or is a party (other than a party suing in the right of the Corporation), or is threatened to be made a party, to any

threatened, pending or completed action by or in the right of the Corporation to procure a judgment in its favor by reason of the fact that the person is or was a director or officer of the Corporation, or is or was serving at the request of the Corporation as a director or officer of another domestic or foreign corporation for profit or not-for-profit, partnership, joint venture, trust or other enterprise against expenses (including attorneys' fees) actually and reasonably incurred by him or her in connection with the defense or settlement of the action if he or she met the standard of conduct of acting in good faith and in a manner he or she reasonably believed to be in, or not opposed to, the best interests of the Corporation.

Indemnification shall not be made in respect of any claim, issue or matter as to which the person has been adjudged to be liable to the Corporation unless and only to the extent that the Court of Common Pleas of the judicial district embracing the county in which the registered office of the Corporation is located or the court in which the action was brought determines upon application that, despite the adjudication of liability but in view of all the circumstances of the case, such person is fairly and reasonably entitled to indemnity for the expenses that the Court of Common Pleas or other court deems proper.

Section 16.3. Employees and Agents. The Corporation may, to the extent permitted by the 1988 BCL, indemnify any person who is or was an employee or agent of the Corporation, other than an officer, or is or was serving at the request of the Corporation as an employee or agent of another domestic or foreign corporation for profit or not-for-profit, partnership, joint venture, trust or other enterprise, against expenses (including attorneys' fees), judgments, fines and amounts paid in settlement actually and reasonably incurred by him by reason of his service on behalf of the Corporation, provided such person has met the applicable standard of conduct as would apply in any particular instance under the 1988 BCL.

Section 16.4. Mandatory Indemnification. To the extent that a director, officer, employee or agent of the Corporation has been successful on the merits or otherwise in defense of any action or proceeding referred to in Sections 16.1, 16.2 or 16.3 of this Article XVI, or in defense of any claim, issue or matter therein, he or she shall be indemnified by the Corporation against expenses (including attorneys' fees) actually and reasonably incurred by him or her in connection therewith.

Section 16.5. Advancing Expense. Expenses (including attorneys' fees) incurred by an officer,

director, employee or agent in defending any action or proceeding referred to in this Article XVI may be paid by the Corporation in advance of the final disposition of the action or proceeding upon receipt of an undertaking by or on behalf of such person to repay such amount if it is ultimately determined that he or she is not entitled to be indemnified by the Corporation as authorized in this Article XVI.

Section 16.6. Procedure.

(a) Unless ordered by a court, any indemnification under Section 16.1, 16.2 or 16.3 of this Article XVI shall be made by the Corporation only as authorized in a specific case upon a determination that indemnification of the director, officer, employee or agent is proper in the circumstances because he or she has met the applicable standard of conduct set forth in Section 16.1, 16.2 or 16.3.

(b) Expenses shall be advanced by the Corporation to a director or officer upon a determination that such person has met the applicable standard of conduct set forth in Section 16.1 or 16.2 of this Article XVI and has satisfied the terms set forth in Section 16.5 of this Article XVI.

(c) Expenses may be advanced to an employee or agent of the Corporation upon a determination that such employee or agent has satisfied the terms of Section 16.3 and 16.5 of this Article XVI and, in view of all the circumstances of the case, such person is fairly and reasonably entitled to advancement of expenses.

(d) All determinations under this Section 16.6 shall be made:

(1) With respect to indemnification under Section 16.3 and advancement of expenses under Section 16.6(c), by the Board by a majority vote.

(2) With respect to indemnification under Section 16.1 or 16.2 and advancement of expenses under Section 16.6(b),

(A) By the Board by a majority vote of a quorum consisting of directors who were not parties to such action or proceeding, or

(B) If such a quorum is not obtainable, or, if obtainable and if a majority vote of a quorum of disinterested directors so directs, by independent legal counsel in a written opinion, or

(C) By the shareholders.

Section 16.7. Nonexclusivity of Indemnification.

(a) The indemnification and advancement of expenses provided by, or granted pursuant to, this Article XVI shall not be deemed exclusive of any other rights to which a person seeking indemnification or advancement of expenses may be entitled under any Bylaw, agreement, vote of shareholders or disinterested directors or otherwise, both as to actions in his or her official capacity and as to actions in another capacity while holding that office. Section 1728 (relating to interested directors; quorum) of the 1988 BCL shall be applicable to any Bylaw, contract or transaction authorized by the directors under this Section 16.7. The Corporation may create a fund of any nature, which may, but need not be, under the control of a trustee, or otherwise secure or insure in any manner its indemnification obligations, whether arising under or pursuant to this Article XVI or otherwise.

(b) Indemnification pursuant to Section 16.7(a) shall not be made in any case where the act or failure to act giving rise to the claim for indemnification is determined by a court to have constituted willful misconduct or recklessness.

(c) Indemnification pursuant to Section 16.7(a) under any Bylaw, agreement, vote of shareholders or

directors or otherwise, may be granted for any action taken or any failure to take any action and may be made whether or not the Corporation would have the power to indemnify the person under any other provision of law except as provided in this Section 16.7 and whether or not the indemnified liability arises or arose from any threatened or pending or completed action by or in the right of the Corporation.

Section 16.8. Insurance. The Corporation shall have power to purchase and maintain insurance on behalf of any person who is or was a director, officer, employee or agent of the Corporation, or is or was serving at the request of the Corporation as a director, officer, employee or agent of another domestic or foreign corporation for profit or not-for-profit, partnership, joint venture, trust or other enterprise against any liability asserted against such person and incurred by him or her in any such capacity, or arising out of his or her status as such, whether or not the Corporation would have the power to indemnify him or her against that liability under the provisions of this Article XVI.

Section 16.9. Past Officers and Directors. The indemnification and advancement of expenses provided by, or granted pursuant to, this Article XVI shall, unless otherwise provided when authorized or ratified, continue as

to a person who has ceased to be a director, officer,
employee or agent of the Corporation and shall inure to the
benefit of the heirs and personal representatives of that
person.

Slides Presented at the Report-Out Conference held March 20, 1997

Agile Web Pilot Program Report-Out Conference



**Agenda: Agility In Practice
Thursday, 20 March 1997**

- Introductions
- Opening Comments
- Overview of Practical Agility
- The Market for Agile Web
- Evolution and Lessons Learned
- Legal Issues
- Cultural Changes and the Web Transformation
- Panel Discussion and Questions

Technology Reinvestment Program

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Agility In Practice Background



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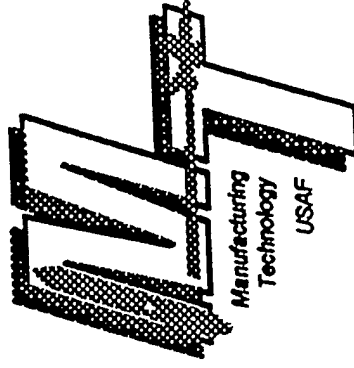
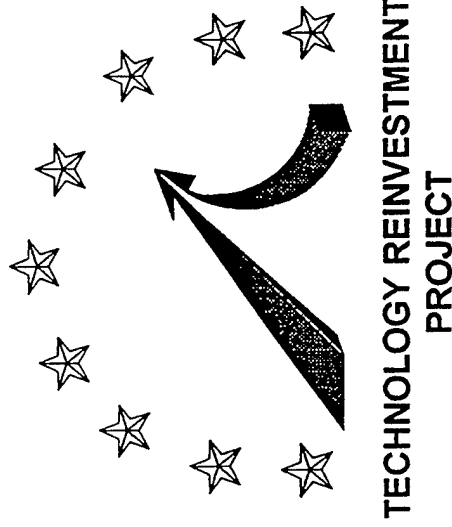
- Non-profit economic development organization
- Hosted by Lehigh University
- Prime sponsor: Commonwealth of Pennsylvania
- Mission: Stimulate and support business innovation

Technology Reinvestment Program

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Agility In Practice Background

Agile Web Pilot Program



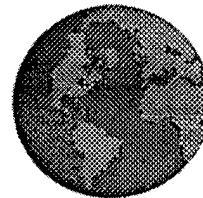
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Agility In Practice Market Need



- Manufacturing processes transported to developing countries
- Customers restructuring
 - Want more from fewer suppliers
 - Time to market/customization advantage



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Agility In Practice Goal of Agile Web Pilot



- Find/develop practical value of agility concepts for manufacturing suppliers
- Learn how collaboration can add value to the system through real projects
- Focus on next level or paradigm

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Agility In Practice Limitations to Overcome



- Suboptimization within food chain
 - Everyone tries to maximize their role
 - Customer manages integration/optimization
- Most levels reactive versus strategic/proactive
- Untapped competencies and assets



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Agility In Practice Evolution in Approach



- Closed learning consortium to market-driven business
(win customers the hard way)
- Loose relationships to formal structure
 - More comfort for customer
 - Vehicle for internal focus and relationships
 - Additional skills and expertise
- Contracts to explicit consensus on ethics and operating practices



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Agility In Practice Key Lessons Learned



-
- Market need there and growing
 - Rapid product development
 - More functionality at lower cost (value)
 - Technology enhances not drives
 - Limited impact alone
 - Best to enhance new culture
 - Key is open collaboration (think for whole)
 - Based on trust and relationships
 - Counter culture and risky
 - Enablers not well developed
-

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Agility In Practice Collaboration



-
- Empowered by larger common goal (whole)
 - Trust others versus protect self (relationships)
 - Decisions mostly by consensus
 - Seek and value others' contributions
 - Can-do mind set, confident, comfortable with risk
 - Customer must join in
-

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Agility In Practice Incentive for Agility



Who is taking the most risk?

- One who keeps traditional approach?
- One who risks new relationships to provide more value?

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Implementing Strategic Agility ***Agile Web, Inc.***

Next generation manufacturing solutions

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Introduction

■ What is strategic agility

- ◆ Inter-company
(makes small companies look like big companies)
- ◆ Intra-company
(makes big companies look like small companies)

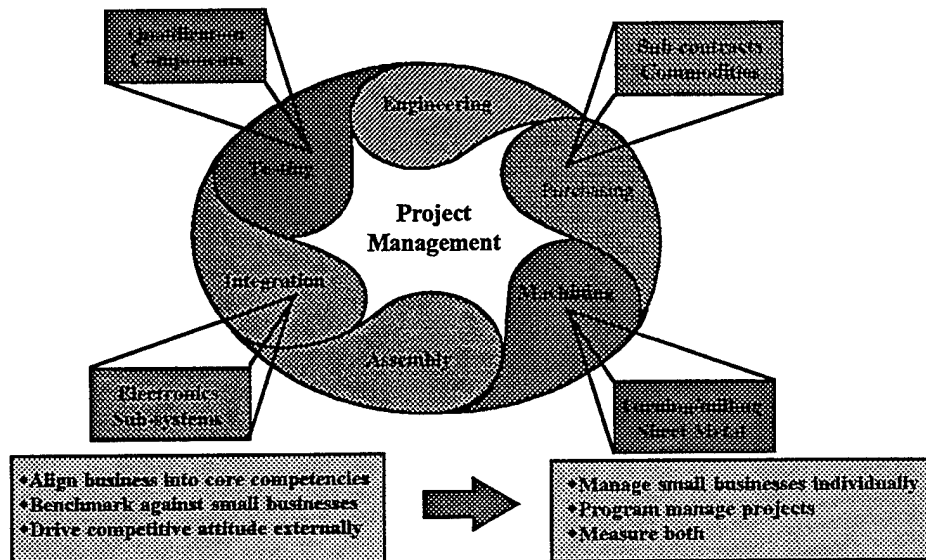
■ Agile Web contracting

- ◆ Business development approach
- ◆ Project management approach

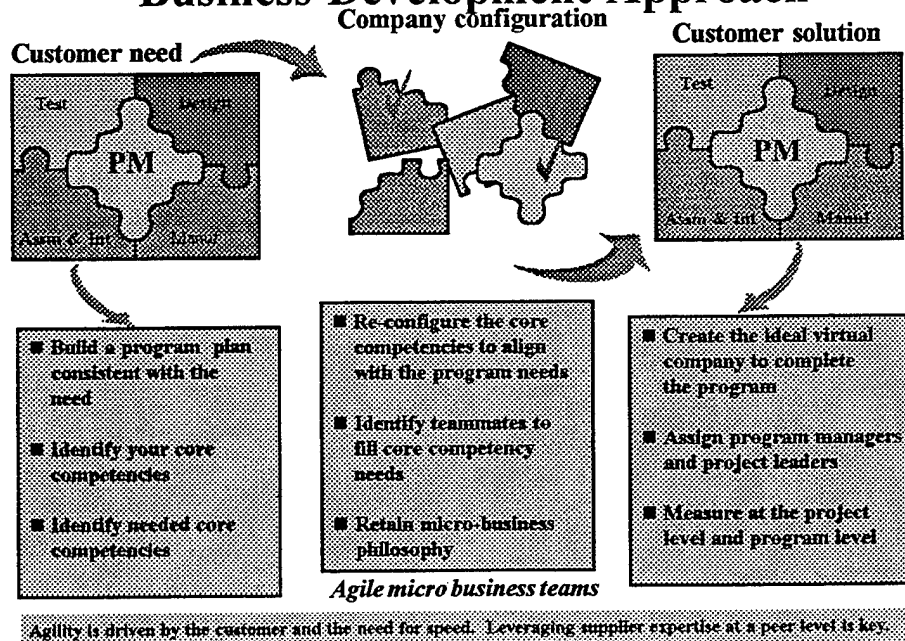
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Micro-Business Model



Business Development Approach



Why Agility Can Help

- Better understand yourselves
- Employee involvement in business success
- Targeting investments to markets

Compete anywhere you have a core competency

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How Agility Can Help

- Drives competition to the lowest level of an organization
- Targets your company assets to the opportunities

Involves more employees in business development...and competition

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Lessons Learned 1993-1996

- **Letting the customer create the “ideal supplier”**
- **Trust shows through to the customer**
 - ◆ **Excited suppliers build customer confidence**

Share to gain works

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Implementing Inter-company Agility

- **Organizing the small companies of a Web**
- **Sharing virtual assets, expertise, and capital**
- **Sharing access to each others customers,
then offer higher value services**

Creating big companies from small

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Implementing Intra-company Agility

- **Organizing by micro-businesses**
- **Using information technology to configure customer oriented virtual companies**
- **Challenging micro-businesses to compete in their marketplace**

Creating small companies from big

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Agile Web Customer Experiences

- **Lockheed Martin, GE, RX-Excel, UTP, NACCO, Identicom**
- **Different approach to each customer, same underlying strategy**

Customers create the supplier 'team' on all projects, AWI provides the teamwork

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Outlook for Strategic Agility

- *Chief Executive* magazine roundtable, December 1996 issue
- Agility enables the big company/small company approach to the market

Agreement on the need, but most executives are looking for a place to begin

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Evolution and Lessons Learned

Getting Started: A New Idea Agile Web Pilot Program

First Steps-An Outgrowth of :

- Agile Manufacturing
- Consolidation of supplier chains
- Idea to Implement concepts with SME's

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Evolution and Lessons Learned

Agile Web was created to:

- Validate the premise that cooperation enhances competitive capability
- Help to define new business practices that SME's needed to meet future competitors
- Help large firms work with a supply base that could meet and exceed their needs

Technology Reinvestment Program

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Evolution and Lessons Learned

Agile Web Goal:

Demonstrate that agility creates the virtual vendor of choice by providing the optimal solution in the form of:

- High value added through innovation, combined core competencies and integrated services
- Rapid response, even for extreme needs
- Flexible capacity
- Competitive pricing

Technology Reinvestment Program

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Evolution and Lessons Learned

Forming the Organization for the Experiment

Agile Web Supplier Criteria:

- Willing to implement innovative business practices
- Demonstrate forward thinking, risk-taking leadership
- Willing to support cooperative efforts
- Contribute a range of production capabilities including electronics, fabrication, design, machining, plastics

Technology Reinvestment Program

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Evolution and Lessons Learned

Forming the Organization for the Experiment

Agile Web Customer Criteria:

- Willing to input orders into the virtual experiment
- Anxious to integrate new practices into their supply bases

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Evolution and Lessons Learned

Taking a Closer Look at Web Companies

- Three year project began in 1994
- Suppliers, Customers and Service Providers met face-to-face to begin to build RELATIONSHIPS



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Evolution and Lessons Learned

Ben Franklin staff, in cooperation with external resources, began data gathering process with respect to the individual companies

- Profile Sheets
- Expectation Interviews
- Business Practice Reviews
- Core Competency Reviews
- Development of Customer Proposals



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Evolution and Lessons Learned

Working Together for Business Opportunities

- Trust began to grow as a result of face-to-face interactions
- Relationships began to develop, but their strength could not be tested in the context of live orders
- Nine bidding opportunities in the first six months (traditional build to print, lowest cost focus)

We recognized the need for a marketing strategy

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Evolution and Lessons Learned

Relationships

- Needed time to facilitate personal interactions
- Team building occurred at different rates

Assessing Suppliers

- Learned companies' strengths and weaknesses
- Helped BF staff learn more about the companies



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Evolution and Lessons Learned

Technology

- BF staff began initial exploration of how technology tools might help

Operations

- Questions about how to validate quality within the Web from one supplier to another

Marketing/Customers

- No live orders, but bidding opportunities helped to formulate working relationships
- Worked with initial customers to identify opportunities



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Evolution and Lessons Learned

The Market Strategy:

- Contracted with consultant
- Surveyed customers
- Determined traditional procurement channels would not be effective
- Needed high level engineering personnel as points of entry to get involved early in product life cycles

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Evolution and Lessons Learned

Target :

- Fortune 500's with strong R & D emphasis
- Mid-sized firms that need design and start-up manufacturing services
- Early-stage firms that need design and manufacturing capabilities



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Evolution and Lessons Learned

New Business Practices began to emerge:

- Process to Qualify Web Opportunities
- Method to quickly create a virtual firm and the obligations and rights of the participants
- Recognized need to present a unified response to the customer

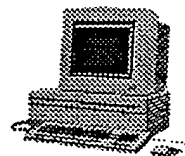
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Evolution and Lessons Learned

Installation of Systems Improvements

- Avoid Integration Issues
- Electronic Commerce
 - EDI
 - Email



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Evolution and Lessons Learned

Simulation Day Helped Participants to Understand:

- Benefits of teaming for the customer
- Sharing of cost structure information within the Web is necessary to give the customer the optimal, collaborative solution
- Processes for quick decision making are needed

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Evolution and Lessons Learned

Simulation Day Helped Participants to Understand:

- Interface with the customer is essential to provide value-added service
- Optimal solutions for the customer will not occur if we try to equally distribute the work
- Definition of the manufacturing process

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Evolution and Lessons Learned

Experiment or Entity?

After a year of building relationships, partnering through the Web and through non-Web business, all members of the project team began to envision a business entity that would thrive without the support of the federal project and would provide their individual firms with unique growth opportunities

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Evolution and Lessons Learned

Operational Need To Build The Entity:

- Recognized the need for a resource to strategically market the Web and to assemble the virtual organization for each project
- Saw the benefit of having a single point of contact for customers
- Provided a vehicle to screen business opportunities
- Met with legal counsel to understand the issues associated with the creation and operation of the entity

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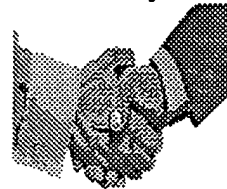
Evolution and Lessons Learned

Relationships

- Built trust and comfort levels to present unified customer responses
- Simulation reinforced the need for trust

Marketing/Customers

- Look at entire product life cycle
- Address optimal improvements for the customer's entire system



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Entity/Legal Structure

- Group began to envision an entity that would thrive on its own
- Explored legal aspects

Technology

- Explored Electronic Commerce (EDI, Email)



Operations

- Simulation promoted teamwork and the development of optimal solutions



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Evolution and Lessons Learned

Business Plan Development

- Marketing Strategy remained as originally defined
- Ben Franklin team addressed question of how Agile Web is different from other networks, associations, etc.
- Structured as a C-Corporation led by a strong president

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Evolution and Lessons Learned

Business Plan Development

Led to formation of three teams to address business issues

- The Legal concerns surrounding the formation of the entity
- The Marketing Plan and its implementation
- The Operation of the Entity



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Evolution and Lessons Learned

Working on concrete issues energized the project and the relationships among participants

- Peer recognition of commitment to the process occurred
- Decisions about fundamental operational and business issues were made by the company leaders
- The smooth addition of four new companies to the Web was proof that relationships were strong and growing

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Evolution and Lessons Learned

Business Issue Teams:

- Legal
- Marketing
- Operations

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Evolution and Lessons Learned

The Operations Team:

- Customer Response Process
- Virtual Organization Agreement between the Web and the Customer
- Quality System
- Compensation
- Warranties and Liability

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Evolution and Lessons Learned

Operations Team

- Operations Team worked to identify the issues that must be covered by the virtual agreement
- Realistic simulation was designed to test out the risks and rewards

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Evolution and Lessons Learned

Marketing Issues Team

Review and Implementation of the Marketing Strategy led to:

- Contracts with advertising and public relations firms
- Recognition that a personal selling approach to senior managers was necessary
- Development of marketing communications pieces
- Definition of product and target markets

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Evolution and Lessons Learned

Legal Issues Team

- Incorporation
- Ethics Statement
- Strong President Model
- Dispute Resolution



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Evolution and Lessons Learned

Growth in Relationships

- The issue team structure provided an opportunity for members to develop strong personal relationships and to understand more about the other Web firms
- Individual commitments to the Web varied among the members
 - some understood the vision
 - some were part of the organization to gain business, not new practices
 - some were in the middle

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Evolution and Lessons Learned

Infusing Agility Through the Web: Individual Company Workforces

- Members began to realize that to be successful in the Web, they needed support of employees in their operations
- As the number of potential business opportunities surfaced, the Web members became more willing to bring their projects and their people to Agile Web

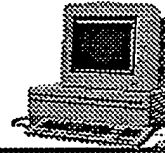
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Evolution and Lessons Learned

Infusing Agility Through the Web: Individual Company Workforces

- EDI and Sales training sessions were conducted for the people who represent these areas
- A seminar about cultural migration was presented to help the CEO's see the value of strategically transforming their organizations and helping their employees to understand the fundamentals of the business



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Evolution and Lessons Learned

Developing the Optimal Structure: The Creation of Agile Web, Inc.

- June 1995
- Creative Use of Standard Contract/Corporate Law
- Equity of AWI does not grow
- AWI fills role of:
 - customer relationship manager
 - knowing web members' core competencies
 - pulling the right virtual organization together for the customer
 - implementing the strategic marketing plan
 - continually enhancing web capabilities

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Evolution and Lessons Learned

Start-Up Issues for Agile Web, Inc.

- BF staff person served as the acting president
- Board of Directors was formed and assumed their duties
- Accounting firm was hired
- Operating budget was approved
- D & O insurance was purchased
- Search for full-time president was initiated

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Evolution and Lessons Learned

Relationships

- Peer recognition of commitment to Agile Web
- Formed teams to address legal, operational and marketing issues

Assessing Suppliers

- Assessed new firms when they became participants

Marketing/Customers

- Marketing Strategy adopted
- Use of communication pieces

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Evolution and Lessons Learned

Entity/Legal Structure

- Structure for incorporation

Operations

- VOA Simulation
- Began Quality system review

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Evolution and Lessons Learned

Workforce

- Considered how to deploy agile practices through each organization
- Considered possibilities for helping companies go through cultural transformation

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Evolution and Lessons Learned

Year Three-Agile Web Project Extension

Goals include:

- Testing new business practices
- Hiring a president
- Identifying value-added opportunities
- Actively using the Board of Directors to determine how to operate the Web through the VOA

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Evolution and Lessons Learned

Push for New Market Opportunities

- New business and new customers continued to be a prime focus
 - Commercial as well as DoD and DLA opportunities were pursued
- Publicity generated inquiries from customers and potential replicators

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Evolution and Lessons Learned

Web Quality System:

- Quality Survey from Each Firm
- Review of Individual Quality Manuals
- Customer Quality Requirements
- Individual Company Assessments Using Interim Level of ISO
- Visual Assessor Software
- Improvement/Action Plans

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Evolution and Lessons Learned

Technology in Fall '95

- Drive to make communications easier and more effective
- Recommendations from the business reviews to integrate systems in order to facilitate transactions
- Consideration of a core competency database
- Short-term proposal



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Evolution and Lessons Learned

Business Opportunities: Narrowing the Focus

- First Order
- Bringing Customers: Are they Ready?
- Value-Add Validated

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Evolution and Lessons Learned

Workforce Issues: Cultural Migration Seminar

- Prompted several Web firms to explore how they could take their firms through the process
- Ben Franklin contracted with an organization that had the resources and experiences to develop this type of process

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Evolution and Lessons Learned

Relationships

- Participants continued to build trust
- Began bringing customers

Assessing Suppliers

- Review of individual quality systems

Marketing/Customers

- Publicity generated inquiries
- Narrowed the focus

Technology

- Worked to improve the communications systems

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Evolution and Lessons Learned

Operations

- BOD worked to define operations and hire president

Workforce

- Cultural Migration awareness

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Evolution and Lessons Learned

Transition to Reality: The New Organization

- 1996: A pivotal year
- Web President hired
- Focus was to obtain business
(the new President had several ideas and strategies
to address large customers)
- Initial Client Development Teams were established
- Some members saw opportunities to sell the Web to their client base;
others saw the Web as a sales arm for their organizations
- One member left the Web because their market strategy was not
aligned with the Web's

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Evolution and Lessons Learned

Collaboration Increases

- Participants improved skills to represent the Web
beyond their home companies
- Participants started to present a united position to customers
- During customer meetings, Web members suggested
several innovative solutions

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Evolution and Lessons Learned

Drivers To Develop the Operating Principles

- Customers wanted contractual agreements with the Web members
- Initial VOA was viewed as punitive
- Incidents of non-collaborative behavior

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Evolution and Lessons Learned

The Virtual Organization Agreement: Developing Operating Principles

Created questions to explore and promote agreement on a broad range of business issues that the Web would face in the future

- Two useful methods were defined in this process
 - Use of actual examples to illustrate behavior that had occurred in Web transactions
 - Verbatim notes that documented the evolution of the group's thinking

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Evolution and Lessons Learned

The Virtual Organization Agreement: Developing Operating Principles

- Ultimately a set of Operating Principles were defined and each Web member made a personal commitment to conduct business within the parameters

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Evolution and Lessons Learned

Cultural Issues

Even when top managers understand the need to alter a company culture, the reality of the process is very challenging

- Managers fear they will lose control
- Unintentional reversion to old behaviors leads to cynicism
- New thinking versus traditional thinking

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Evolution and Lessons Learned

Cultural Issues

- Companies working together in a Web are transforming at different rates
- Reconfirmed that building trusting relationships is the key element in the success of this type of venture
- Signaled the need to develop a prototype (multi-media product) to facilitate organizational change

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Evolution and Lessons Learned

Technology Results

Web Communications System:

- Stand alone computer and non-Internet email and EDI software initially installed-inconvenient
- Upgrade to Internet email and WWW browser capability
- Enhanced system included video conferencing with ISDN lines, shared application
- Shared database with Web-wide accessibility

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Evolution and Lessons Learned

Barriers to the Use of Technology

- Email through company LAN's was not used by some and others did not have the technical skills to do the work
- Internal systems challenges
- Web members were not willing to use the video or EDI systems unless current customers required the interface
- Cost of Training
- Risk of Mistakes

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Evolution and Lessons Learned

Moving Ahead

- Core competency database completed, but access not achieved
- Capabilities in place
- Observed that small businesses require pre-established, compelling business needs to convince them to use the technology
- Efforts re-focused from technology to operations and marketing

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Evolution and Lessons Learned

Agile Web Interface with DoD and DLA

- Little defense experience-different process and culture
- Thought AWI would become a supplier of short run, critical parts that were no longer commercially available
- Efforts were constrained by other priorities and budget considerations
- Agile Web has the ability to provide significant value to the military through work with defense prime contractors

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Evolution and Lessons Learned

Transition to a Self-Sustaining Web

- Operating Principles were agreed to and adopted by the AWI member companies
- Over 80 customer opportunities had been presented
- Some members continued to struggle with the practice of approaching the customer as a representative of AWI rather than their own company
- Many team and collaborative practices occurred
- Financing was needed to ensure a smooth transition and to sustain the organization

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365

Evolution and Lessons Learned

The New Organization

- BF staff members and the Agile Web Board of Directors worked to determine how the transition would occur
- Member companies committed their own funds to meet cash flow obligations
- Continued voting membership required a minimum of \$10,000 of support from each company

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Evolution and Lessons Learned

The New Organization

- Shares of stock would be issued to the companies for their investment
- Legal papers were drawn to change the Articles of Incorporation and by-laws and to generate a Subscription Agreement

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Evolution and Lessons Learned

The New Organization

- Non-contributors retained membership and single vote for original \$1.00 commitment
- Ben Franklin pledged to match a significant portion of the funds committed by the companies
- Ben Franklin will retain the only Preferred Stock
- One additional person was hired to support the president in his marketing efforts
- New Board of Directors was elected

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Evolution and Lessons Learned

Relationships

- Collaboration in representing the Web as a whole increased
- Learned that building relationships is the key element for success

Marketing/Customers

- Focus on obtaining business
- Client Development Teams formed
- Obtained Initial Multi-company Business

Technology

- Upgraded to Internet mail and WWW browser capability
- Enhanced the system with video conferencing and ISDN lines, shared applications

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Evolution and Lessons Learned

Operations

- Transition to Reality
- Some change in membership
- VOA: Developed Operating Principles
- Needed financing

Workforce

- Companies are working together, but transforming at different rates

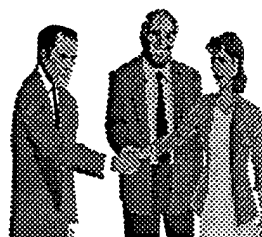
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Legal Issues

AgileWEB
Non-proprietary manufacturing solutions

- Form of Entity: For Profit C-Corp
- Liability/Tax Issues
- Anti-Trust
- Dispute Resolution
- Ethics Statement
- Easy Exit Policy



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Legal Issues

AgileWEB
Non-proprietary manufacturing solutions

Easy Exit Policy Vs. Need for Capital

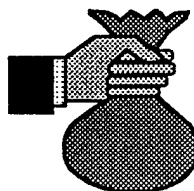
One Dollar-One Vote

- Allowed Easy Exit
- Equal Shares
- All Profit to Project Participants



Issuance of Stock

- Need to Capitalize
- Limited voting stock



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Cultural Changes and Web Transformation

Ethics Statement

- Good Start in 1995
- Generated by Members
- Experiences Showed More Definition Required

1996-A Truly Pivotal Year

- Must be Self-sustaining by Year End
- New President on Board
- Help is Needed to Move Forward as an Entity

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Cultural Changes and Web Transformation

The Davison Group Brought on Board

- Had the Required Expertise to Facilitate the Members
- Understood the Underlying Issues
- Developing a Multi-Media Tool

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Cultural Changes and Web Transformation

Principles of Operation

- TDG Focused the Web on Key Issues
- Reinforced the Need for Entity Operating Principles
- Drove the Process

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Cultural Changes and Web Transformation

Multi-Media Project

- Tool for Facilitating Organizational Change
- Partially Built on AWI Experiences
- Useful to Other Organizations
- Objective is to Help Organizations Change More Rapidly

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